VIRGINIA JOURNAL OF EDUCATION

SCIENCE NUMBER

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Picture to right—
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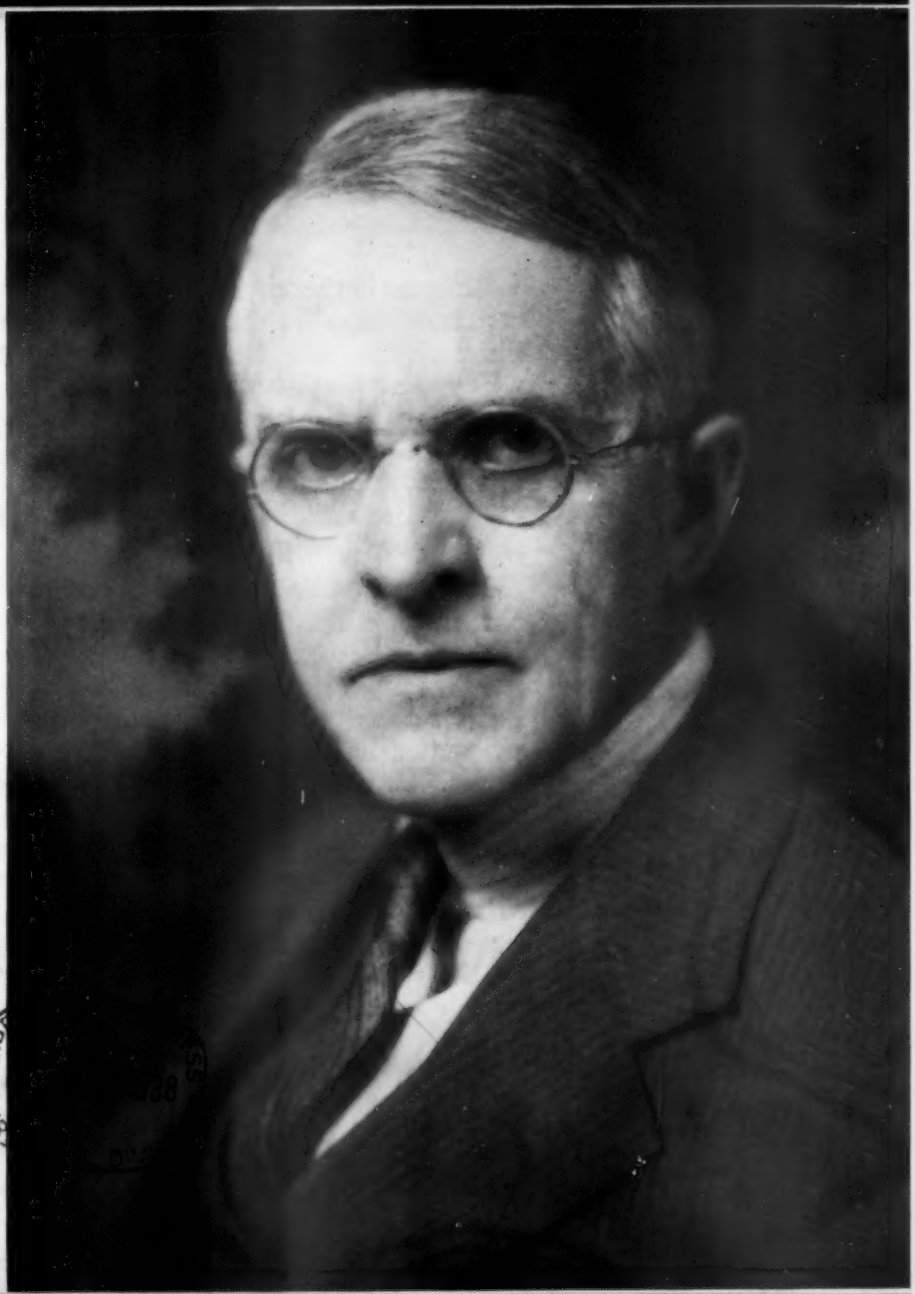

DECEMBER, 1938

Vol. XXXII No. 3

OFFICIAL PUBLICATION OF THE VIRGINIA EDUCATION ASSOCIATION

A Message

to the

Teachers of Virginia

from

DR. WESLEY C. MITCHELL, PRESIDENT

American Association for the Advancement of Science

Science is incomparably the most powerful instrument that man has developed for dominating his environment. Its humble beginnings in work-a-day knowledge of materials and processes raised man above the brutes; its present scope makes possible a standard of living higher than any nation has achieved in practice; in its further growth lies mankind's best chance of future progress in well-being.

But the power that science confers may be used for many ends. How science will be used is an issue that becomes graver the more power science confers upon men. This issue is not one that scientists can decide; if they could, the world would present a less deplorable spectacle of waste and strife. But teachers of science can exert some influence upon the emotional attitudes as well as upon the technical proficiency of their pupils, a few of whom will become investigators, all of whom will become citizens. It is our grave responsibility and our high privilege to do what in us lies toward forming a generation that will use wisely the power science gives it.

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EDITORIAL COMMENT . .

WANTED—A STATE SUPERVISOR OF SCIENCE

Those who are familiar with the recent activities of both the British and the America Associations for the Advancement of Science have observed that these organizations are laying an increasing amount of emphasis upon the obligations of science to society. Scientists in high places are becoming more and more aware of the gap that exists between the laboratory and the public. They are alarmed at the impact of science upon the social body politic and are concerning themselves with the social adjustments to applied science. Practically, this means that large organizations like the American Association are emphasizing the educational aspects of the several sciences. Perhaps the desire to further this ambition in the South was an important reason why Richmond was selected as the meeting place in 1938 of the largest and most important of the American scientific organizations.

Although organized science has so far made little progress in this commendable objective, it is at least conscious of its obligations to society and aims to take advantage of every avenue not merely to make the public science conscious but to get people to use the instruments and benefits of science for the betterment of mankind, to apply the method of science to their own lives, and to extend it to many social and economic phases of life not generally regarded as within the scope of science.

What better medium than the public schools have we to achieve this worthy objective?

Science teachers of Virginia, in common with teachers the country over, are likewise aware of this obligation of science. They are busy devising techniques and in other ways seeking means to make science "a way of life" for the ordinary citizen. In this State, however, they are without effective leadership. The state colleges can hardly be expected to furnish this sort of leadership. The State Department of Public Instruction has not yet provided a supervisor for this special field of instruction.

The first step toward a unified system of science instruction in the public schools is to provide a science supervisor for the State. Science is a relatively new subject of the curriculum of the public schools and obviously should have the maximum of supervisory direction. This need is vividly illustrated by the existing chaotic approach to science in the elementary schools. Here you find teachers who have never had a college course in science and are painfully aware of their own limitations and yet who are gamely struggling to amass the necessary subject matter and at the same time trying to grasp unconventional methods of conveying the subject to young children. Never in the history of Virginia elementary schools has a new subject been introduced with so little preparation and with such a complete absence of guidance. It has been thrust upon the already-burdened shoulders of every elementary teacher as an extra chore. In all fairness it may be asked, "What sort of scientific concepts may we expect to result from much of the teaching?" And it must be reiterated that it is not necessarily the fault of the teacher in every case; it is our failure to provide leadership for the teacher. It is little wonder that many elementary teachers do not accept the science assignment with enthusiasm and that some of them treat it in a profunctory manner.

Now that science has gained recognition as an elementary school subject there arises the problem of the grade placement of subject matter—manifestly something that calls for corporate action under proper leadership. Coupled with this is the additional task of working out a unified eleven or twelve-year program of instruction in science. The keeping abreast of new developments in the field of methods can only be done with the aid of a supervisor. It is as unreasonable as it is unjust to expect unity and coordination in a science program when the teacher has nobody to look up to and to direct her.

As to the type of supervisor needed, only one or two observations of a negative nature can be made at this time. In the first place, at this stage we do not need an office supervisor, one who is bound to carry on research in methods to the detriment of the more urgent problem of visiting teachers in the field and at their group meetings. There is ample research being carried on elsewhere: to digest this and pass it on to teachers and groups is the pressing problem just now. Secondly, a specialist is not needed. A person with an adequate science back-

ground certainly, but not one who is so deeply enmeshed in a special field of science that he cannot have a sympathetic understanding of all fields, elementary through senior high school.

GEORGE W. JEFFERS,
State Teachers College, Farmville.

SCIENCE AND PUBLIC OPINION

J. W. Studebaker, United States Commissioner of Education, in delivering an address over the Columbia Broadcasting System Network October 4, made an interesting point showing how science has affected public opinion. He said, "A man on horseback sat one night with his eyes fixed on a church steeple. He was watching for a message to be transmitted by lanterns. 'One if by land or two if by sea.' . . the number of lights in the steeple would indicate by which route the British were approaching. The message came to this man on horseback and then he rode miles at a gallop to pass it on. That happened in the modern era of history. But the message was unknown to some people in America for several days and even weeks.

"Contrast with the broadcast of a long message from Washington a few days ago. Within seconds after the message was prepared at 3 o'clock in the morning people all over the United States, who had been told to expect an important statement at that time, heard every word of it. People in Europe, at their breakfast tables, got it by short wave. But more than that—within six hours competent students of the international situation from New York, London, and other capitals analyzed its meaning and significance. Within six hours from the time a typewriter had made the final draft, that message was the topic of discussion in all parts of the civilized world. People heard it on loud speakers, then read it in the morning newspapers.

"This strange and yet powerful thing we call public opinion was feeding on that message. In the time that it would have taken Paul Revere to ride less than 100 miles with his message, the appeal of the President of the United States for peace went around the globe and became a part of world public opinion.

"This serves merely to illustrate how we have annihilated time and made it possible for people to get an accurate and exact statement of an important message together with clarifying comment on its implications for peace or war.

"But the means of communication have gone beyond this. We have been able to sit at our radios and to hear the dictators and the democratic leaders express their positions and to argue their case. We got not only what they said but we experienced the manner in which they said it. Maps and charts clarified the situation for us. Pictures were flashed by wireless to enable us to see important aspects of the crisis we were discussing and trying to understand. We heard the crowds shout. We experienced what it means to prepare cities for air bombardment. We followed the mobilization of troops and were given a real sense of the meaning of it.

"Literally, *we stood on the brink of war* and we were able to see vividly some of the consequences of a false move.

"Historical facts were marshaled and presented to us in order that we might understand the background of the situation. Conflicting opinions and views were presented from all parts of the world. The issue was approached from every angle and sharpened by critical comment. We learned much in a very short time.

"This achievement in making the major crisis in this decade vivid and understandable to the masses of people calls for the unreserved praise of educators. But it calls for more than praise. In my judgment, it is the responsibility of the educational forces to *keep the discussion going* and to prepare for better use of the press and radio in organized education in the future."

THE LIFE-GIVING DEAD SEA

Mr. E. Ray Casto, of Emory and Henry College, has made an investigation of the important products of the Dead Sea. We think of this source of wealth in connection with Biblical literature. The Dead Sea is forty-seven miles in length and nine and one-half miles in width. Its surface area is 340 square miles lying 1,292 feet below sea level, and its greatest ascertained depth is 1,308 feet. It has for centuries received the fresh and sweet waters of the Jordan and other streams. Each day there flows into the Dead Sea 1,750,000,000 gallons of water.

The shortage of potash during the World War led the British Government to undertake researches in

the Dead Sea brine. It was ascertained that this brine shows enormous quantities of salts as follows:

Postassium Chloride	2,000 million metric tons
Magnesium Bromide	980 million metric tons
Sodium Chloride	11,000 million metric tons
Magnesium Chloride	22,000 million metric tons
Calcium Chloride	6,000 million metric tons
Calcium Sulphate	120 million metric tons

These, when converted into marketable forms, are materials that the world needs and amount to 200,000,000 metric tons. It is estimated that 40,000 tons of potash are added annually by the Jordan and its tributary streams.

Another product of this brine of the Dead Sea is crude potash which is used in a number of different industries, namely: electroplating, photography, medicines, tanning, dyeing, and in the manufacture of soda, glass, matches, and explosives, but its chief use is as a fertilizer and forms about ninety-two per cent of the total supply of potash used in the manufacture of fertilizers. Still another product of the Dead Sea is bitumen. A pure bitumen from the Dead Sea has been so abundant as to give the sea one of its popular names, the "Asphalt Lake." This bitumen originated from extrusions from various fissures in buried strata and large quantities of it come to the surface and drifts ashore, especially during periods immediately following earthquakes in the region. Sulphur is another common product that is obtained from the Dead Sea.

THE MAGIC WORLD OF COLOR

Herbert Thompson Strong, many years ago a designer of fabrics, took up the study of the science of color merely as a hobby. From different parts of the world, he collected specimens of nature's colors in birds, butterflies, minerals, jewels, etc. which he has used as motifs for designs, also studying how nature had produced color in these subjects. Recently he has developed a mechanism and method which have revealed nature's secrets by the use of a powerful ultra violet ray. He has brought to our vision colors more beautiful than ever conceived by the brain of man. These are produced by projecting prismatic rays into a mammoth crystal of optical quartz, and, by projecting polarized light through minute chemical crystals, there appears on the screen a phantasmagoria of color—a composite of the Grand Canyon, a desert sunset, and Aladdin's cave. In addition, he has brought forth, by a powerful ultra violet light, dull gray rocks which reflect the colors of flaming jewels, demonstrating the fact that there is an unknown world of marvelous beauty just beyond the visible. He says he does not know a more fascinating subject which plays such an important part in our everyday life. "What the eye does not admire the heart does not desire."

George W. Jeffers

DR. JEFFERS DID A GOOD JOB

We take this opportunity of expressing our appreciation to Dr. George W. Jeffers, Professor of Biology at the State Teachers' College, Farmville, for his most excellent assistance in assembling the Science material for this issue of the JOURNAL. We are greatly indebted to Dr. Jeffers for this splendid piece of work.

Why Science Teachers Should Attend the Virginia Meeting of the American Association for the Advancement of Science

SIDNEY B. HALL, *Superintendent Public Instruction*

DR. RUFUS COLE, of the hospital of the Rockefeller Institute for Medical Research, has recently published a paper in which he tells of an experience he had in his medical training with his hospital chief, Sir William Osler, one of the great teachers of medicine. Dr. Osler never missed a scientific meeting in his community or any medical one of importance in the country if he was physically able to attend. Dr. Cole writes, "I once remember when Dr. Osler was hurrying off after dinner to one of these meetings, an attractive young assistant was drumming on the piano, 'Jim, aren't you going to the meeting?' 'No, I don't get much out of these meetings.' 'Do you think I do?' was the reply, and he slammed the door and ran down the steps." A teacher of any subject in the public school system loses one of the best opportunities of "getting ahead" if he or she fails to be seen at meetings outside of school work. What one "gets out of the meeting" from the speaker is, in most cases, unimportant compared to just being seen present. The person who makes worth while contacts outside of his regular duties is the one who gradually gets to have "a little more on the ball" when opportunities for advancement present themselves. There is no better place to become acquainted with people interested in your own ideas and problems than at meetings having to do with your own work.

Dr. Sidney B. Hall

This year from December 27 to 31 there will be held in Richmond a scientific meeting which teachers of science in all the schools of Virginia should plan to attend, and for three reasons.

First, The American Association for the Advancement of Science has accepted the invitation of Virginia citizens to meet in Richmond this fall. All those interested in science in the State should feel it their duty to cooperate with the committee in charge of arrangements. One way to help is by attending the meetings in which you are interested. There will be over a thousand papers read and many important addresses given, so no matter what your interest in science may be there will be something for you to hear, and much for you to see.

Secondly, the convention will be the largest one of diversified science ever to meet in Virginia. It is expected that some six thousand persons interested in science will attend. Your joining this group cannot help but impress you with the importance of your work in starting pupils on their way in science studies. When you return to your teaching, the enthusiasm you will have derived from such a convention is sure to be passed on to those under you.

Thirdly, your attending the meeting or helping with the arrangements for it will help you personally. You will make many contacts which will be invaluable to you. There is no important scientist in the country who will not take time to talk with teachers of science in the public schools, simply because you hold such an important place in youth education.

If there are any details concerning this important gathering of scientists in Virginia which you would like to have, questions sent to Dr. Sidney S. Negus, Medical College of Virginia, Richmond, will have immediate answers.

As its contribution to the pupils and teachers of the public schools of the State, the local planning committee for the Virginia American Association for the Advancement of Science meeting in Richmond the latter part of December has arranged for a big meeting at the Mosque for Saturday morning, 10:30 o'clock, December 31st. At this time Dr. William M. Mann, director of the National Zoological Park, Washington, D. C., will show and explain his famous motion pictures having to do with the capture of wild animals. This complimentary motion picture show has been arranged solely for Virginia pupils, their folks, and their teachers.

Greetings

From

DR. F. R. MOULTON

Permanent Secretary, A. A. A. S.

The American Association for the Advancement of Science sends its cordial greetings to the educators of Virginia through the *Virginia Journal of Education.*

Education is unquestionably the most important work being carried on in our country, for the future of our civilization depends upon it. Even from the point of view of the numbers of persons engaged in it and the money expended on it, it ranks with the greatest industries.

In the process of education almost all sciences are involved—the physical and engineering sciences in the production and operation of the educational plants, the biological and medical sciences in protecting and developing the bodies of students, the psychological sciences and the arts in developing and maturing the minds, emotions and ideals of those who will be our successors.

Education is both a science and an art. It depends upon scientific principles no less than do physics or chemistry, though they are much more difficult to establish. Experimentation to develop principles is as important for education as for any other subject. But principles are not enough. Art is required to put them into effect. Teachers work with delicate and wonderfully precious material, the development of which requires wisdom, untiring zeal, and deep human sympathy.

The Association has a vigorous Section on Education which is exploring the various aspects of education as a science and an art. It has the advantage of close relationships with other sections which together cover essentially all the fields of pure and applied science. The Association welcomes the cooperation of all progressive educators and hopes that its Virginia meeting in Richmond from December 27 to 31, inclusive, will advance the cause of education throughout the southeastern states.

RESOLUTIONS ADOPTED AT DISTRICT MEETINGS

District G—Winchester, October 15, 1938

REVOLVED

1. That this Committee recommend that in the future the meetings of District G be held on a day other than Saturday, and be it further resolved

2. That the District G organization be requested to ask the local associations of the district to request the school board of their counties to suspend school activities for the day of the district meeting without loss of compensation to those teachers who attend.

3. That District G heartily endorse the Three-Point Program and recommend that local associations use all possible influence to aid in carrying it out in its entirety.

4. That whereas the graduates of our high schools in many instances are too young to go away to college and too young to be absorbed in industry, be it resolved that this committee recommend that all the schools in this district be organized on a twelve years' basis as soon as practicable.

5. That this committee recommend that teachers be notified by the school board of their reappointment, or the termination of their service, six weeks before the close of school, when it is possible to do so.

6. That the proposed Amendment by District G to the Constitution and By-Laws of the Virginia Education Association be adopted as follows:

Art. II. Committee Sec. 1, No. 4.

The three appointed members of the committee shall serve as tellers for the elections, and shall receive from the board of directors through the executive secretary written instructions necessarry to the governing of the elections.

Art. III. Local Associations and Voting. Sec. 4, line 7, strike out the following words: "or about".

Art. III. Sec. 6.

(a) voting—sentence 2 beginning on line 5, change to read: any local association desiring to have one member cast the entire voting strength of the association shall do so only by majority vote of the local association. Written notice of such action of the local association shall be signed by the president and secretary of the local association and presented to the credential committee before casting the vote.

Art. III. Sec. 6.

(e) Strike out the entire section.

Art. III. Sec. 6.

(f) Change to (e).

7. That the proposed Amendment to Art. V, Election of officers, Sec. L, be not endorsed.

8. That this District G Association endorse the creation of the editorial board for the VIRGINIA JOURNAL OF EDUCATION, and be it further resolved

9. That increasing authority be given this board in

accordance with the policy underlying its creation. Be it further resolved

10. That we extend the thanks of the association to Mr. Quarles and the Winchester teachers for their hospitality and the very constructive work that they have done.

ROSE MACDONALD, *Chairman.*

DISTRICT H—OCTOBER 21, 1938, WARRENTON

RESOLVED:

1. That the members of District H, Virginia Education Association, express their appreciation to the Parent-Teacher Association of Warrenton, to Superintendent Thomas, Mr. P. B. Smith, and the teachers of Fauquier County, to those who arranged for our entertainment, to the speakers who participated in the programs, and to those who helped secure these speakers.
2. That the members of District H, Virginia Education Association, endorse the creation of an Editorial Board for the VIRGINIA JOURNAL OF EDUCATION and urge that the Board be given increased authority in the preparation and publication of the Journal.
3. That the National Education Association and the Virginia Education Association have and are rendering a worth while service to America and to teachers specifically. That these two Associations deserve the support of every individual member of our District group.
4. That the continual work of revising the Virginia Curriculum is a positive force for the improvement of public education in Virginia.
5. That cooperation among the nations of the world is a worthy aim, and that America should take a leading part in such cooperation in the interests of permanent peace.
6. That the service the government is rendering in the field of conservation of our natural resources be recognized and that our schools place added emphasis on this major function of social living.
7. That the schools of Virginia recognize their responsibilities in assisting youth to meet its perplexing problems, especially with reference to vocational guidance and the worthy use of leisure time.
8. That the members of District H, Virginia Education Association, go on record as urging the State Department of Education to cooperate financially with the counties desiring to employ a music supervisor.
9. That the members of District H, Virginia Education Association, endorse the entire Three-Point Program and request the General Assembly of Virginia to enact it into law at the earliest possible date consistent with the financial ability of the State to support it.

The first step for enactment into law by the 1940 General Assembly to be:

A sound Retirement Law for teachers which will require approximately	$ 700,000
An increase in State appropriation for teachers' salaries of aproximately	1,300,000
	$2,000,000

The second step for enactment into law by the 1942 General Assembly to be:

An increase in State appropriations for teachers' salaries approximately	$1,700,000
Provision for free textbooks approximately	800,000
	$2,500,000

10. That a copy of these resolutions be placed in the hand of each member registering for the meeting, and a copy be presented to the VIRGINIA JOURNAL OF EDUCATION for printing therein.

Committee { CHARLES MONROE, R. R. TOLBERT, Q. D. GASQUE

District M—Blacksburg, October 22, 1938

WHEREAS we are a division of the Virginia Education Association, we do declare ourselves in sympathy with the forward movements in the State for the advancement of public education and we recognize that this progress depends in a large measure upon our continued appreciation and support of the policies of our leaders.

THEREFORE, BE IT RESOLVED:

1. That we continue our efforts in bringing about a realization of the Legislative Committee's Three-Point Unified Program at the next session of the General Assembly of Virginia.

2. That we urge the increase of membership in the National Education Association, this to include membership by associations as well as individuals.

3. That we request our representatives in Congress to support the bill that will give Federal aid to public schools, such Federal aid to be considered for education so long as it does not take from the individual states the control of the schools or dictate their administrative policies.

4. That the group does not approve of the substitute re-wording of Article V—Election of Officers, Section I, in the proposed amendments to the Constitution and By-laws of the Virginia Education Association.

5. That we commend the State Board of Education for its policy in looking forward to the expansion of vocational and industrial training in the State.

6. That we express our appreciation for the well planned State program of special education which is far reaching in its implications.

7. That we express our appreciation to the State

Board of Education for its contribution to child development through cultural activities which has been furthered by the appointment of Dr. Luther A. Richman as State Supervisor of Music and for the emphasis upon art in the supervisory program, and for the suggestive library bulletin issued by Mr. C. W. Dickinson, Jr.

8. That we appreciate and commend the recent efforts and contributions of the National Administration to the cause of world peace.

9. That we rejoice in the emphasis upon the teaching of democracy in the Virginia Curriculum and pledge ourselves to uphold the philosophy of the Curriculum.

BE IT FURTHER RESOLVED:

1. That we express our appreciation to President Julian A. Burruss and to the Virginia Polytechnic Institute and the Montgomery County Teachers Association for the hospitality and courtesy extended; to Mr. R. O. Bagby, President of District M, for the excellent program; and to the speakers, group leaders, and to all who have contributed to the success of the meeting.

VIRGINIA PORTER LAWRENCE, *Chairman.*

DISTRICT C—RICHMOND, OCTOBER 28, 1938

I. That the District reaffirm its endorsement of the Three-Point Program of the Virginia Education Association and recommends that the Virginia Education Association secure the adoption of the Three Points in the following succession:

1. An actuarially sound retirement law for teachers. The Committee recommends that this be made the first major objective in order that the superintendents, faculties of the State Teachers Colleges and others who are not included in the present law may become immediate beneficiaries of the new law and that all teachers may begin at once to build up an adequate retirement allowance. In this way the teachers will reap the benefits of the joint resolution passed by both bodies of the Virginia Assembly calling on the Governor to make provision for an actuarially sound retirement plan in his budget. The immediate passage of a sound law would enable any older persons to retire at once and remove the constant fear of a reduced annuity from the minds and hearts of the teachers already retired.

2. A minimum school term of nine months with a minimum average salary for teachers of not less than $720 a school year.

3. Textbooks furnished at the expense of the State to all pupils attending the public schools.

II. The study of the question of legal, indefinite tenure of office for teachers with the view to the passage of a law setting up some such provision.

III. That all teachers consider more seriously their part in their professional organizations, local, state, and national, to the end that they may promote a better integration and understanding of their profession so that it may achieve a more general recognition in the affairs of the state and nation.

IV. That teachers everywhere exercise to the fullest their rights and privileges as voting citizens.

V. That the District reaffirm its belief of the Single Salary Scale for teachers which provides for equal pay for equal work, training and experience.

VI. That the District express its gratification in the extension of vocational education within the State and its hope for the further extension for vocational education, guidance and placement in the State.

VII. That the District reaffirm its belief in the necessity for an increase in federal aid to education in the State and that it congratulates Superintendent Sidney B. Hall for the splendid work he is doing to bring about this increase of federal aid to the states on a sound basis and pledges him the District's enthusiastic support and cooperation.

VIII. That the members of the District do all in their power to promote membership in the National Education Association of the United States and its Departments.

IX. That the District express through its officers to Governor Price the appreciation of every member of the District of his interest in and support of the public schools.

X. That the members of the District express to the following persons their appreciation of the many things that have been done to make this Convention a success.

1. To the Program Committee and speakers who have planned and carried out such an excellent and enjoyable program.

2. To the Committee on Arrangements who have added so much to our pleasure and comfort.

3. To the teachers' organizations that have taken an active part in the carrying out of the plans of the Committees.

4. To the manufacturing plants and others who have opened their doors for the teachers to visit them.

5. To the newspapers for their publicity and the many others too numerous to mention who have added their part in making this meeting a success.

XI. That the District request the Virginia Education Association to appoint a committee to consider some suitable memorial to Mrs. Mary Branch Munford, one of the founders of the Cooperative Education Association, a Branch of the Virginia Education Conference, the predecessor of the present Educational Conference.

XII. In keeping with the spirit and purpose of the plan of the proposed change in the Constitution and By-Laws pertaining to nomination of the officers of the Virginia Education Association which has been offered by District C Association and published in the

October issue of the VIRGINIA JOURNAL OF EDUCATION and in order to stimulate a larger and wider interest in the affairs of the State Association and to promote a more democratic procedure in the selection of its officers, we believe that the next president of the Virginia Education Association should be drawn from the ranks of that fine body of men and women in rural education in Virginia, preferably a principal, supervisor or classroom teacher.

Committee { CORNELIA ADAIR, C. K. HOLSINGER, ELSIE COLEMAN

RESOLUTIONS OF GILES COUNTY TEACHERS 1938-39

We, the members of Giles County Teachers Association, in our regular annual meeting assembled at Pearisburg High School, October 15, 1938, do hereby submit the following resolutions for adoption:

Whereas, the Teachers Association of Giles County greatly feels its loss in the passing of Virginia Joyce Snidow, and wish to express their deepest sympathy to Mr. and Mrs. B. H. Snidow and faimly, and

Whereas, we also feel that one of our most efficient and faithful members has been removed from our midst in the loss of Mr. H. W. Reynolds, and to his family we wish to extend our sympathy;

Therefore, be it resolved:

That the secretary send a copy of these resolutions to the bereaved families.

Whereas, we take this opportunity of expressing to Superintendent Johnston our appreciation for the progressive administration that he has given to the schools of Giles County.

Therefore, be it resolved:

First: That we pledge our full support to Superintendent Johnston and hereby express our confidence in his ability to administer successfully the schools of Giles County.

Second: We express our appreciation to Superintendant Johnston and the school board for the adoption of our present salary schedule, which is an initial step toward adequate salaries and request that beginning the year 1939-40 our salary be in ten payments instead of nine.

Third: We, as members of the Parent-Teachers Association, wish to express our appreciation for the safer and more comfortable transportation system.

Fourth: We wish to express our appreciation to our most efficient President, Mr. H. E. Agee, for his untiring efforts in furthering our educational program.

Whereas, we go on record as heartily recommending an adequate teacher tenure law in the State, and

Whereas, we request that teachers may be relieved of the insecurity of unemployment, we urge and petition that teachers be contracted with not later than April 1, of each year, and

Whereas, the teaching facilities are limited for adequate instruction and since such facilities are necessary to meet the required program;

Therefore, be it resolved:

That we, the teachers of Giles County, request the school board to furnish such supplies.

Whereas, every teacher in Giles County pays Poll Tax and is above average intelligence, and we believe that the State and Nation would profit by more intelligent voters;

Therefore, be it resolved:

That we urge each teacher to see that his or her vote is cast for the candidate who will loyally support the educational program of the State and County.

Whereas, we belong to the greatest profession in the Nation and since we are influencing more lives;

Therefore, be it resolved:

First: That we strongly urge every teacher of Giles County to be loyal and conscientious in the profession.

Second: That we make the teachers' meeting more democratic and that we express our opinions here and refrain from undue criticism of our association.

Third: That a copy of these resolutions be published in the *Pearisburg Virginian*, a copy be sent to the VIRGINIA JOURNAL OF EDUCATION, and that a copy be sent to the school board of Giles County and spread upon the minutes of this organization.

Committee { DOROTHY LUMSDEN, MRS. K. S. FRENCH, ALGA MUNSEY

RESOLUTIONS OF RESPECT ON THE PASSING OF MISS MARY G. COAKLEY, NELSON COUNTY TEACHER

Whereas, God in His infinite wisdom removed from our ranks on the evening of October 14, 1938, our beloved co-worker, Miss Mary G. Coakley, we submit the following resolutions of respect.

We have lost our veteran active teacher, one who had given fifty-two years to a profession she held to be the supreme of all professions.

Under her leadership hundreds of lives have been molded and guided, and sent out into life's activities as useful men and women. There are no monuments so cherished, so valuable, so precious as a living human being and Miss Mary, as she is lovingly called, has left hundreds of them in whose memory she will always live.

Miss Mary entered the profession when just a girl of seventeen. She grew with the profession, and her experiences were many and varied—some sad, some interesting—from the little log hut schoolroom to those of our modern and well equipped school buildings.

She was young in spirit and kept well abreast with the times. Her heart and helping hands went out to the orphans, the unfortunate, the progressive citizens alike. Hers was a world that excluded no one.

Having taught under many superintendents she loved and spoke of each one in a beautiful and Christianlike spirit. The superintendents she served under were Mr. George Caskie, Mr. Walter Fitzpatrick, Mr.

Henry T. Harris, Mr. B. M. Wailes and Superintendent W. E. Kidd.

She often expressed a desire to die in harness and be a burden to no one.

God sits on His throne and judges as He has these thousands of years and her desire was thus granted. Her last thoughts were and said in the interest of her school and pupils.

In her passing, we, as teachers, feel keenly our loss, and we shall ever miss her interesting conversations and ideas, but we feel and know that our loss is her gain.

Be it resolved that this be spread upon the minutes of the Educational Association of Nelson County, and that the Secretary of this Association be directed to send a copy to *The Lynchburg News*, to the VIRGINIA JOURNAL OF EDUCATION, and to her nearest relatives.

Committee { BLANCHE HENDERSON; MRS. NETTIE B. JONES; MRS. REBA LEA }

SCIENCE INSTITUTE AT LYNCHBURG

Under the auspices of the Lynchburg Teachers' Club, the Lynchburg schools have had the opportunity to participate in a two-day Science Institute led by Dr. Gerald Craig, of the Department of Natural Sciences at Teachers College, Columbia University. Dr. Craig is author of *Pathways in Science*, a series of readers used for supplementary work in the Lynchburg schools. He was in Lynchburg Tuesday and Wednesday, October 25 and 26, and acted as consultant of Science lessons, each lesson one hour, taught each day in L2 grade at Thomas C. Miller School, in H4 grade at Fairview School, and in H6 grade in Garland-Rodes School. It was so arranged that each elementary teacher observed two of the demonstration lessons. There was also an informal conference of teachers of Science and Practical Arts in the Robert E. Lee Junior High School.

Each afternoon Dr. Craig delivered a general lecture to the entire teaching staff of the Lynchburg schools. In his first lecture he dealt largely with Science content in the public schools, and in the second with methods of teaching, emphasizing the fact that in good teaching there is no real separation of the two, and that the line between elementary and secondary schools should be completely broken down.

The L2 grade had been working for three weeks on a unit, "We Look about Us". The pupils had brought in many interesting specimens of animals, plants, seeds, and rocks for their museum. These specimens provoked many good questions which were written on the board, and those for which the pupils could not find answers were saved for Dr. Craig.

In an informal manner, discussing things freely with the children and by asking questions and showing by experiment, he cleared up for the little L2's such puzzling questions as how fish, tadpoles, caterpillars, and butterflies breathe, why a turtle can't eat out of water, why the leaves turn various colors in the autumn, how animals protect themselves, how they get ready for winter, how air is taken from water, and why an airship cannot fly to Mars.

At Fairview School, the H4 grade's unit was "The Story of the Sky". The pupils were intensely interested in their unit and had acquired much information about the heavenly bodies. They wanted Dr. Graig to explain what held the sun, the moon, and the stars in the sky; they wanted to know if stars fall when they shoot across the sky and what happens to them when they fall. The discussion of gravity was most interesting and Dr. Graig cleared up many points for the pupils. A magnet was produced by one of the boys and the pupils learned the difference between gravitation and magnetism. Ideas about reflected light were made clear and the pupils were led to see the difference between bodies that make their own light and those that reflect light. When one pupil wanted to know why the earth turns on its axis, Dr. Graig asked if any one could explain this. A little boy volunteered and gave an excellent report. Dr. Craig complimented him and asked where he got that information. Promptly the lad replied, "From your book".

The pupils were greatly concerned about the phases of the moon, why it was different shapes at different times. Using a child with a flash light as the sun, another child as the earth, and a third child as the moon who traveled around the earth keeping her face always toward the earth, Dr. Craig patiently showed this again and again until the children saw for themselves how it is that the earth has the dark of the moon sometimes, crescents at others, and full moon at still other times.

The H6 grade at Garland-Rodes School had been studying the heavenly bodies. Beautiful diagrams of the planets, star constellations, and comets' paths covered the board. The pupils explained to Dr. Craig what they had been studying and gave excellent reports on the heavenly bodies. They had made lantern slides of these things which they showed to Dr. Craig and the visiting teachers.

There were lively discussions on questions asked by pupils, such as, would the earth burn up if the sun exploded, what would happen if the earth stopped rotating, how people know how hot it is on the sun, why the moon looks white, how rough surfaces can reflect light, what the sun is made of, how fast light travels, why the sun and planets always stay in their orbits. The topic of the most absorbing interest was comets. Through discussion, questions, diagrams, pictures, and reading the pupils found out what the comet's tail is made of, the comets' paths and habits, that they are not real stars but get their light from the sun, and that the earth once went through the tail of a comet but would never have known it if astronomers hadn't told it.

By questioning, Dr. Craig got the pupils to tell him that they live in the city of Lynchburg, the State of Virginia, country of United States, continent of North America, on planet Earth, in our solar system.

"What next?" asked Dr. Craig, "anything beyond the solar system"?

The pupils had no idea, so he told them that the next and last is the Milky Way Galaxy, and asked if they had any idea how large it is. A boy heaved a sigh and said, "It must be tremendous".

One of the girls asked, "When you put all these together, what do we have?"

"The Universe", said Dr. Craig.

"But what is the universe?" she persisted.

To which Dr. Craig replied, "Everything".

SCHOOL SCIENCE FAIR

The Virginia Section of the American Chemical Society acting as hosts to the first Virginia meeting of the American Association for the Advancement of Science will sponsor a School Science Fair to be held in the Hotel Jefferson lobby December 27-30, 1938.

Several outstanding examples of student skill and ingenuity are expected to be entered and a number of ten and five dollar prizes will be awarded for general excellence in the exhibits.

The general public and particularly all teachers and visiting scientists are cordially invited to see the displays.

Dr. Ira A. Updike, professor of chemistry at Randolph-Macon College, Ashland, Va., is in charge of the Fair.

MAJOR W. CATESBY JONES
Vice Chairman, Planning Committee, A. A. A. S.

ON THE AIR

Two educational programs on scientific subjects now on the air for the particular benefit of pupils in the public schools are highly recommended by scientific leaders in the State.

The two include "Your Health," given over the NBC Blue Network and WRTD at 2 P. M. each Wednesday, and "Science Everywhere," a junior science feature scheduled over the same hookup from 2:00 to 2:30 P. M. each Tuesday.

A. M. A. Backs Program

"Your Health," presented under the auspices of the American Medical Association and the National Broadcasting Company, is broadcast to aid schools in teaching health. Its material is selected by the bureau of health education of the American Medical Association.

"Science Everywhere" is given under the auspices of the American Association for the Advancement of Science. Directed by Dr. Carroll Lane Fenton, noted author of children's science books, its programs are divided into two parts—the first quarter hour for the elementary grades and the second for the intermediary grades.

Some of Those Planning the First A. A. A. S. Virginia Meeting

DR. F. R. MOULTON
Permanent Secretary, A. A. A. S.

LLOYD C. BIRD
Chairman, Local Planning Committee, A. A. A. S.

DEAN WORTLEY F. RUDD
Chairman, Advisory Committee, Virginia Section, American Chemical Society, A. A. A. S.

DR. SIDNEY S. NEGUS
Chairman, Public Relations Committee for the Virginia Meeting of the A. A. A. S.

A Science Symposium

A PRINCIPAL LOOKS AT SCIENCE TEACHING

L. F. ADDINGTON,
Wise

IN joint meetings of secondary school science teachers and college science professors, the writer has heard the professors accuse the secondary school people of not having taught the high school graduates anything. "I'd rather have a high school graduate who had had no chemistry come into my class as a college student," he heard one college professor say. On the other hand he has heard secondary school people say, "We are not so much interested in how the college feels about it."

To the writer it occurs that the divergence in these two viewpoints lies in the failure of either school to see the picture in its broadest scope. Many college people do not yet seem to realize that education is a continuous process; too many secondary school people yet follow the idea of preparing the students to answer type questions rather than to develop the attitude of research, which is essential to any scientist.

If education is continuous, then a closer correlation of curriculum offerings in science should be worked out between the secondary schools and the colleges. Anyone who may take time to scan a few science books, biology, chemistry, physics, etc., will see that too many college texts follow the same trend of organization as secondary school texts, and present similar matter—but in bigger doses. Now, if our science teachers are to glue themselves to textbook teaching entirely, there can be no continuous process until texts can be organized and used in a continuous way, which will probably never come.

We know by past experience that but few secondary school pupils will reach academic colleges, but in their own communities they will need to know simple things about electricity, food supply and preservation, disease and prevention, conservation of soil and timber and wild life.

The set-in-her-way teacher will select one book and have the pupils study it page by page, its contents being entirely out of line with the needs of the pupils at that particular time. Only a miracle in publishing could adapt any book to the particular needs of a given group of pupils at a given time in so far as science ties in with living.

In the very first steps of teaching science in the secondary school, the teacher should take a look at the needs of the pupils. That will require an inventory of the community in which the pupils live. It will require a look into the immediate future of the class. Suppose the town has a contaminated water supply, a diphtheria epidemic, or a serious threat of typhoid. The alert teacher will then begin to build a unit of work in accordance with the need. She will not hunt out those pages in a science book (that are) on the subject and say to the class, "Study that and tomorrow tell me what it says." She will let the class participate in building objectives, in formulating culminating and minor activities; she will insist that they themselves order materials from the State Board of Health; that they talk with the county health officials; that they search every available source for information.

Therefore, we get outcomes other than mere knowledge. We build the ability of doing research, which is immediately valuable to every student in the class and which will prove especially valuable to those who may later enrol in college science.

These same pupils should be taught to live what they preach. They can see to their own sanitary conditions at home. They can train a brother or sister in the ways of healthful living, carrying home bulletins, reporting to home folks what has been found out at school.

This period of science teaching, of course, will follow the general outline of the "Core" content, which is sufficiently elastic to permit always of teaching in terms of pupil and community needs.

Now, it is expected of the science teacher to be alert enough to suggest to her class probable sources of materials outside the adopted text. If she is to do this she will have to examine monthly some of the leading magazines on science; she will have to be familiar with the "Tentative Course of Study" for the purpose of material selection as well as direction in procedure.

The science teacher will not leave the librarian alone to select such science materials as may go into the library orders but will be well enough informed in the general science field to advise the librarian as to the proper materials to order.

If the science teacher will throughout the school year list new and pertinent books that can be used,

she will at the opening of the next session have an order ready to turn over to the librarian.

One of the outstanding failures of science teachers seems to be that they do not prepare far enough ahead in order to get best results when classes are in session. This year, for instance, a science teacher should be studying a general outline of her work for next year. To this skeletonized course of study she can fit sufficient and pertinent materials. One of the greatest difficulties in the use of the "Tentative Course of Study" lies in the fact that too many wait until time to teach a class before attempting to use it. A year is not too long a time in advance to begin assembling materials.

The science teacher should at least be familiar with every book on science in the school library. We may have that valuable book, *Microbe Hunters,* on the library shelf and a few pupils may read it, but if the science teacher knows nothing about it and does not draw it into use in class work it is of little value to the classes in science.

More and more, it seems, science teachers are getting the idea that the class period is for study rather than for recitation. Science demands research; then why not let research progress through the class period? Sixty minutes spent in allowing members of the class to answer questions is mostly time lost, for, according to experiments in education, recitation has little to do with learning.

A summing up of the finding of the students after a unit is complete will prove interesting and will, perhaps, give practice at oral speech. The exchange of information, if different committees have been at work, will constitute probably the greatest phase of learning at this stage.

Beyond the "Core" of the science curriculum, we may expect to teach chemistry, physics, and other specialized sciences to a greater detail. Here, the writer believes, is the point at which the secondary school and the college curriculums need to be revised so that a continuous process will prevail. Nothing is more deadening to a high school graduate than to enrol in a college science class and have to say to himself, "Well, I had most of that in high school." In all probability he will expect to ride through on what he already knows, or he will become so bored with the rehash that he "fails to make the grade".

But few of our high school graduates expect to go immediately into science as a vocation. In some industrial centers, however, effort is made in high school to fit the pupil who expects to go to work to meet a certain degree of the demands of society. After all, it is this ultimate demand of society that sets the standard.

The science teacher is expected to know something about the demands of society in regard to chemistry, physics, etc. That teacher will know something to teach in that direction and will so teach it that the pupils will develop skills which will satisfy society. In this phase even the colleges are woefully behind time. College graduates usually have to spend time in the laboratory of a commercial concern before they can comply with the standards in skills needed by society.

In summation, the writer would like to say that he believes that the ability to do research should be emphasized early in the secondary school; such research should be simple, however. Colleges and secondary schools should find a way to make science teaching continuous rather than repetitive. Science teachers should know something to teach; and, they should know *how* to teach it.

THE SCIENCE TEACHER LOOKS AT HIS JOB

H. R. BAKER,
Thomas Jefferson High School, Richmond

WHEN the science teacher looks at his job seriously he sees that it is threefold:

First, to stimulate and direct the minds of his students to comprehend the fundamental principles of scientific thought and investigation which have been accumulated from the beginning of time to the very present. These principles are the rightful heritage of every student endowed with the mental capacity to receive them. The teacher's first task is to become thoroughly familiar with his subject, for how can he direct the learning of that which he does not know? Any amount of training in methods of instruction will not compensate for the teacher's lack of knowledge of his subject. The teacher likewise is obligated to keep informed on the ever-increasing wealth of information. Most real learning is the product of living experience. The science teacher in order to be most effective must devise demonstration and experimental set-ups from which his students can actually come in living contact with the laws of

science in operation and make them a part of their experience. The well informed and energetic teacher will never allow the lack of equipment or laboratory facilities to stand in his way, for the laws of science can be demonstrated with relatively simple equipment. The teacher's job is to see that every student in so far as possible is well grounded in fundamentals and objectively stimulated to observe the operation of nature's laws in his environment.

The second part of the teacher's job is to inspire his students with a respect for and accomplishment in science. It is essential for the teacher to realize that there can be little inspiration without information. A student who is inspired by the romance of science and believes that his life work is science is doomed to failure unless the teacher will direct his students to realize their limitations as well as their possibilities. It is tragic for a young person to drift into a field for which he is entirely unsuited and for which he has a poor background of information. Many great scientists have been inspired to success by their high school teachers and many failures have been inspired to failure by an over-indulgent teacher who has held out an unattainable goal. The teacher's job is to recognize the student of limited possibilities and to direct him into his proper channel.

The third great problem of the teacher is social. The rank and file of students will be thrown into a society where science and its influence are becoming more and more important. The great job of developing in students the scientific attitude will enable them to take their places in society and become more efficient and useful citizens.

The science teacher's obligations are informational, inspirational, and social, and the greatest of these is informational. It is still true that knowledge is power but only when the knowledge is real and vital and learned in its proper relation to society.

Important Organized Science Groups

AMERICAN SCIENCE TEACHERS ASSOCIATION

Affiliated with the American Association for the Advancement of Science

THE American Science Teachers Association will hold its 6th annual meeting in Richmond, Virginia, on Thursday, December 29. All science teachers and others interested in science are cordially invited to attend the meetings.

Harry A. Carpenter

Among the speakers at this meeting will be:

Dr. Harlow Shapley of Harvard.

Dr. White of the Rockefeller Institute.

Dr. C. S. Piggott of the Carnegie Institute.

A luncheon meeting is being planned, which will be addressed by Dr. Wesley C. Mitchell, President of the American Association for the Advancement of Science. All are invited to attend this luncheon.

The place of the meeting and luncheon will be announced later.

The American Science Teachers Association has been organized for the purpose of coordinating the efforts of science teachers throughout the country to the end that science may better serve the needs of children. Another objective is to serve as a clearing house for the dissemination of information relating to science teaching in its many phases.

All state and local science teachers clubs and organizations are invited to affiliate with the American Science Teachers Association. At present fifteen important science teachers organizations have affiliated, having a total membership of several thousand.

Any science teachers association may affiliate with the A.S.T.A. by making application and contributing $5.00 annually for each director to which they may be entitled.

Individual teachers may become members of the A.S.T.A. by paying $1.00 annual dues to the treasurer.

The business of the A.S.T.A. is carried on by a board of directors representing the various affiliated associations and representing individual membership.

The president for the current year is Harry A. Carpenter, Rochester Schools, Rochester, N. Y.; the secretary, Harry A. Cunningham, Kent State University, Kent, O.; and the treasurer, Homer W. LeSourd, Milton Academy, Milton, Mass.

THE AMERICAN CHEMICAL SOCIETY

CHRISTMAS week of this year is a very important period in the history of science in Virginia, for at this time the American Association for the Advancement of Science will meet in Richmond as guests of the Virginia Section of the American Chemical Society in collaboration with the Blue Ridge Section and the Virginia Academy of Science.

Dr. J. C. Forbes

The Virginia Section of the American Chemical Society was organized in 1915 and since then it has worked faithfully for the advancement of chemistry in the Old Dominion. Today three chemical organizations are found in the State: The Blue Ridge Section with headquarters in Roanoke, The Virginia Section with headquarters in Richmond, and the Hampton Roads Chemists' Club, affiliated with the Virginia Section, with headquarters in Norfolk. All these groups hold regular meetings during the year with distinguished scientists from this country and abroad as guest speakers. These meetings are held in different parts of the State and are always open to the public.

For the benefit of individuals whose primary interest is not chemistry but who are interested in chemistry and its advancement, each of these Sections has an associate membership. All members and associate members of these groups receive the *Bulletin*, the official publication of the Virginia Sections. This publication and the *Journal of Chemical Education*, published by the American Chemical Society, deserve to be on the library shelf of every high school or university chemistry teacher.

The secretaries of the various chemical organizations of the State, whose names are listed below, will be glad to answer any inquiry concerning these organizations.

The Virginia Section, Donald A. Rogers, Solvay Process Co., Hopewell, Va.

Blue Ridge Section, F. F. Morehead, 155 High Street, Salem, Virginia.

Hampton Roads Chemist Club, W. A. Ryder, 1305 Brunswick Park, Norfolk, Va.

The chairman of the Virginia Section is Dr. J. C. Forbes, Medical College of Virginia, Richmond.

THE NATIONAL ASSOCIATION OF BIOLOGY TEACHERS

THE National Association of Biology Teachers was organized on July 1, 1938, in New York City by representatives of a large number of local biology groups from various parts of the country. The organization meeting with the culmination of two years of work on the part of a committee appointed by the Union of American Biological Societies, headed by Doctor Oscar Riddle.

M. D. Campbell

The objectives of the Association as set forth in the constitution are to "facilitate the dissemination of biological knowledge, encourage scientific thinking, make available to teachers information concerning the selection and presentation of biological materials, the relationship of biology to science and education as a whole and to provide a national journal dedicated to these objectives."

The advantages of such an Association to teachers of biology, nature study and related subjects are self-evident. However, membership is not restricted to teachers in secondary schools. The dues are one dollar per year including subscription to the *American Biology Teacher* which is the official organ of the Association.

Inquiries concerning membership should be made directly to the secretary-treasurer. Sample copies of the journal may be obtained from Dr. D. F. Miller, Department of Zoölogy, Ohio State University, Columbus, Ohio.

The president of the Association is M. D. Campbell, Boston, Mass.; the secretary-treasurer, P. K. Houdek, Robinson, Ill.

Biology teachers are invited to attend the meetings of the Association in Richmond on Wednesday, December 28.

THE AMERICAN ASSOCIATION OF PHYSICS TEACHERS

THE American Association of Physics Teachers was formlly organized in late December, 1930, when a group of physicists, interested in promoting the teaching of physics, held an organization meeting at the time of the Cleveland meeting of the American Association for the Advancement of Science. The organizers and charter members felt that there was need for an association to concern itself with "the advancement and the diffusion of the knowledge of physics, with special reference to the teaching of the subject."

F. K. Richtmyer

The activities of the Association are twofold: the holding of meetings and the publication of a journal. In addition to these activities, there are numerous committees of the Association at work on various phases of the teaching of physics.

The Association holds an annual meeting, usually in affiliation with the American Association for the Advancement of Science although from time to time the annual meeting may be held at other times and places. For several years recently, the Association has held a summer meeting in affiliation with the summer meeting of the American Physical Society.

The Association publishes *The American Physics Teacher*, a bimonthly periodical under the editorship of Professor Duane Roller, of Columbia University. This journal contains contributed articles having to do with the various aspects of the teaching of physics, and, in addition, publishes in each issue a survey giving developments in some branch of physics, written by a specialist in the field and directed at the student who is either finishing his undergraduate work or beginning his graduate work.

The Association contains nearly 900 members, most of whom are college teachers of physics. Several local sections have been organized in areas where there is a large number of physics teachers. The annual dues are $5.00, which include subscription to *The American Physics Teacher*.

The president of the Association is F. K. Richtmyer, Cornell University, Ithaca, New York; the secretary, Thomas D. Cope, University of Pennsylvania; and the treasurer, Paul E. Klopsteg, Central Scientific Company, Chicago.

THE DEPARTMENT OF SCIENCE INSTRUCTION OF N. E. A.

I. Aims:

1. To encourage the teaching of science at all levels of public school instruction through the development of a continuous, integrated program of science.
2. To promote the idea that classroom teachers of science should be responsible for the selection of teaching materials to be used in science classes.
3. To extend the idea that classroom science teachers should be consulted in planning classrooms, laboratories, and equipment to be used for science instruction.
4. To encourage group meetings of science teachers to study developments in curricula and practices as local, state and national projects.
5. To encourage the development and use of out-of-door laboratories for science instruction.

II. Qualifications for Membership:

Membership in the National Education Association and interest in science.

III. Dues:

Fifty cents per year. Copy of Proceedings of each meeting.

IV. Officers:

President, Mildred Fahy, Peirce School, Chicago.

Vice-presidents, Philip G. Johnson, Cornell University, Ithaca, N. Y., and Glen E. Cline, Pasadena Junior College, Pasadena, Cal.

Secretary, Mary Melrose, Board of Education, Cleveland, O.

Treasurer, George J. Skewes, State Teachers College, Maysville, N. D.

DEPARTMENT OF RURAL EDUCATION

F. B. FITZPATRICK, *President*
ANNA HALEY, *Secretary*

ELEMENTARY SCIENCE AND ADJUSTMENT TO THE ENVIRONMENT

GERALD S. CRAIG, *Associate Professor of Natural Sciences, Teachers College, Columbia University*

LONG before the development of the scientific method man attempted to explain the rainbow, the sunrise and sunset, meteors, the volcano, and the other natural phenomena. Such phenomena were mysteries to man. The environment was so much a part of man that both the ordinary and extraordinary events demanded explanations, and knowing nothing about the sequence we usually speak of as cause and effect, man early developed myths which were almost childlike in nature. Very frequently these myths were related to the good and evil spirits which he thought existed about him. Thus early his explanations became an integral part of his primitive religions, creating superstitions, taboos, and customs, thereby profoundly limiting his behavior and his attitudes. Unfortunately, these interpretations became fixed and static for relatively long periods because as a part of his tribal religion they were considered true for all times and not subject to modification. The individual who expressed doubt concerning these primitive interpretations frequently was punished and ostracized. Only the strong dared rise above the primitive interpretations because these became so deeply imbedded in the tribal beliefs and thus the explanations advanced by the medicine man or other myth makers became crystallized. Man, as a result, early developed and passed on to posterity wrong meanings about his environment. The constellations became heroes, the volcano became the abode of an angry god, the rainbow a bridge between earth and heaven, the desert a place scorched by the sun chariot and the long dry period the curse of the wrathful harvest god. Man claimed he had the truth about his natural environment when he had little or no truth. His desire for explanation of birth and death, sunrise and sunset, rain and drouth and other happenings in his environment led him into a host of misconceptions. Nevertheless, it was a meaningful environment to him, filled as it was with good and evil spirits.

To the environment he must turn for food, clothing, and shelter, and therefore the method of procuring subsistence was modified greatly by the meaning the environment held for him.

The environment still has meaning to man today in spite of the changes science has made in man's interpretations. Man has observed and studied, he has weighed and analyzed, he has examined and reexamined, he has checked his conclusions. He searches for natural causes for the phenomena of his environment. He knows more about the forces operating to cause the weather, the rainbow, the growth of plants and animals, disease, floods, earthquakes, and volcanoes than ever before. One by one superstitions have been attacked and disproved. His interpretations of explanations of weather, of lightning, of migration, and all the phenomena of life have been altered many times and are still undergoing alteration. He has become less dogmatic and more open-minded. He realizes there is much remaining to be discovered; in other words, his outlook on life has become experimental. In fact, he may be more aware of his ignorance, in spite of the vast accumulation of knowledge, than were his primitive ancestors.

The scientific interpretation of natural phenomena calls for ability to reconstruct knowledge as new truth is discovered, for happy adjustment to the universe and willingness to plan our lives in the light of these sequences of events we observe in life that we call cause and effect. It calls for an acceptance of critical analysis upon all private and public questions and for the elimination of gullibility.

Superstitions and beliefs in primitive ideas are manifest still on the part of many people who have had little contact with the field of science. There are many who are bound and fettered by fears of ill omens, by astrology, fortune tellers, and ideas from other unscientific sources. Such people are adjusted very poorly to modern life. As such, they represent a decided liability in face of necessary social change.

They are victims of the past of mankind, their adjustment to life being based upon content long discarded by the intelligent. Their interpretations are unscientific and fixed and are not subject to change.

So we see that the meaning man attaches to the things which happen in his environment has much to do with his social adjustment. This meaning involves interpretation, therefore, much of man's progress is the result of the new technique that he has developed of securing interpretation, namely, the scientific method.

The way in which man interprets his environment has much to do with the kind of man he is. Thus in considering any discussion of the teaching of science in the elementary school we must conceive of science as the interpretation of the happenings, events, or phenomena of the natural environment. The teacher's task is that of assisting the child in interpreting the environment in such a way as to produce intelligent adjustment to the environment. A nation filled with young people of this latter type will be a well adjusted nation—one able to meet its crises with poise, intelligence, and vigor. Thus for the teacher a keynote of method in the classroom is interpretation. She will need to ask herself if the child is securing for himself the kind of interpretation that is necessary for his intelligent adjustment to the world about him.

But it is impossible for any individual to interpret all the phenomena of the environment. The ultimate aim, therefore, is not interpretation of itself alone but the intelligent adjustment to the environment which can come through meaningful interpretation. The child should come through with a working conception of the sequences we speak of, or cause and effect. The child should come to know that the scientists are unable to explain many things. He should be open-minded on all subjects. In other words, the ultimate emphasis is not upon how much the child knows but upon the development of those basic working conceptions related to desirable attitudes.

Often the instruction in elementary schools in natural science and social studies ends in object lessons, busy work and memorizing small content. The naming and collecting of objects has become in many schoolrooms an end rather than a means to an end. Identification and observation are only means to an end; the end product is the intelligent adjustment through interpretation of the environment in keeping in spirit at least with the best interpretation that man has to offer at the time. The stressing of identification as an ultimate objective has at times developed an impractical program for the elementary school and has led to busy work and object lessons. No teacher should expect to have an ability to identify all the different kinds of objects in the environment.

In a schoolroom visited recently the teacher was concerned only with identification. Rocks, insects, and other objects, animate and inanimate, were merely objects to be named, and the children and teacher seemed thoroughly unhappy. This false aim of identification has proved to be a hazard to good instruction in so many cases. Classroom teachers in the elementary school should not expect to become taxonomists in all fields with ability to identify everything.

And so we see that the teacher interested in analyzing her work for its improvement will do well to think in terms of science as the interpretation of natural phenomena and to ask herself whether the children are making adjustments to life in keeping with basic working conceptions of modern science.

COLLECTING BIOLOGICAL SPECIMENS FOR A RURAL HIGH SCHOOL

MILDRED HILL CRALLE

RURAL sections of Virginia offer large stores of natural materials which can be used to a great advantage by the teacher of biology. Some teachers doubt that this subject can be made interesting and receptive to a class as a whole. It is true that most rural schools have a limited supply of equipment for a science laboratory but this difficulty, although important, can be overcome by a little foresight and initiative on the part of a teacher.

My experience last year in Boonsboro High School in Bedford County proves that the difficulty could be overcome. Although the science laboratory of this school has the usual amount of equipment which is found in any rural school of its size, we supplemented the supply with fruit and mayonnaise jars of various sizes, and with pasteboard "flat-fifty" cigarette boxes. The pasteboard boxes, which were used for insect collection, were made in the follow-

ing way: An oblong window was cut in the top of the box and cellophane pasted over the opening. The receptacle was then filled with cotton and painted black. These improvised articles were used to advantage for the collection of specimens.

The object of collecting was not merely to fill the jars and boxes with animals but to enliven the response of the children to the study of classification of animals. This particular part of biology, although exceptionally difficult for pupils to grasp and enjoy, is very essential for adequate comprehension of the subject.

We used the specimens for the study of characteristics of various animals found in their environment around Boonsboro and also for classifying them in their particular phyla. Theoretically, perhaps, the animals should not be taken from their natural habitat and brought into the classroom, so that the pupils may visit and study animals in their environment.

How far could a class go within the allotted hour? The school makes no provision for supervision of field trips during regular school hours since in such a rural environment it is necessary to leave on the busses at an early hour in the afternoon. Classes were scheduled in such a manner that the pupils of biology had study hour in the science room during another class period and laboratory work was supervised at that time. This arrangement aided in the completion of work begun during the previous period. Dissecting, pickling, drawing, and scouting for the specimens were done during this laboratory hour.

What evidence is there that the class was interested in this work? From my experience I have found that rural children, generally, have an easily acquired love for animals and plants because of their close association with them. From this close association has arisen a keener observation of animal and plant life. We know from experience that they are most interested in those things which they know most about and they evidence a desire to learn even more about them. All the pupils in my class were from rural communities and there was strong interest shown from the beginning.

The strongest evidence of interest is shown by the remark of the one failure in the class. When he found that he had failed, he clapped his hands and said, "Goody, I can take this class next year!"

Science Notes

The sciences have had their martyrs as well as religion.—Richardson.

Man now presides
In power where once he trembled in his weakness;
Science advances with gigantic strides
But are we aught enriched in love and meekness?
—Wordsworth.

The great secretary of Nature—Sir Francis Bacon.
—Walton.

What art was to the ancient world science is to the modern.—Disraeli.

Men love to wonder and that is the seed of our science.—Emerson.

Neuro-physiology is today one of the most active fields of hyphenated science.—Gesell.

Science is for those who learn; poetry for those who know.—Roux.

Every science has been an outcast.—Ingersoll.

A doctor is one who kills you today to prevent you from dying tomorrow.—Punch.

The best physicians are Dr. Diet, Dr. Quiet and Dr. Merryman.

There are about 850,00 species of animals already described.—Lillie.

The use of lenses is one of the greatest scientific discoveries. We do not know who made it.
—Rayleigh.

Science moves but slowly, slowly creeping on from point to point.—Tennyson.

Science is the great antidote to the poison of enthusiasm and superstition.—Smith.

Throw physic to the dogs; I'll none of it.—Shakespeare.

One science only will one genius fit
So vast is art, so narrow human wit.—Pope.

Equipped with his five senses, man explores the universe around him and calls the adventure science.—Hubble.

Science and art belong to the whole world, and the barriers of nationality vanish before them.
—Goethe.

Chemistry can and perhaps will destroy our European civilization.—Urey.

DEPARTMENT OF ELEMENTARY EDUCATION

Conducted by MRS. ELSIE DAVIS BOSLEY, *Fairfax*

HOW ELEMENTARY SCIENCE GOT STARTED IN NORTHAMPTON COUNTY

E. R. OUTTEN, *Principal, Machipongo Elementary School*

IN the fall of 1936, a group of elementary teachers in Northampton County undertook to study elementary science, its problems and its possibilities. Like so many of their fellows, these teachers felt that they were inadequately equipped to direct science in their classrooms. Most of them had had very little training for directing an elementary science program. A few had taken extension courses in nature study, others had majored in science and yet were ill prepared for teaching science in the grades. The amount of professional material available was practicably negligible. Altogether the group undertook the study with about the same background, or lack of background, that any other similar group might possess.

Monthly meetings of the entire group were decided upon, but the teachers in each school met every two weeks. At the initial meeting the chairman stressed the necessity of each member's feeling responsible for contributing something to the study since no one member could be regarded as an authority on the subject. From the ensuing discussion of the problems of elementary science, the following appeared to be most significant:

1. How can science contribute to the purpose of our "units"?
2. How can we recognize valid science interests in children?
3. How can we as teachers gain an adequate subject matter background?
4. Where should science work be done? (Special room or classroom.)
5. Can minimum essentials be set up? If so, what shall they be?
6. What science materials and equipment are necessary to meet the needs of children in carrying out science activities?
7. To what extent shall we adhere to the centers of interest as set up in the Virginia Course of Study?
8. How can we evaluate science outcomes?

In attempting to solve problem 1, we brought along our respective plan sheets and then divided into smaller groups according to the subject matter of the units. That is, those teaching units on "transportation" got together and each told of the science activities being carried on in his unit as well as those planned for future use. Problems of children interest and problems encountered in the handling of subject matter were discussed. In this way all units were enriched to some degree.

Typical of the criteria prepared for determining science interests in children are the following:

a. What children talk about, especially when not stimulated by older people.
b. The voluntary bringing to school of science materials.
c. Reporting on voluntary activities carried on outside of school hours.
d. The questions that children ask.
e. Resistance to termination of an activity.

During our study it became increasingly apparent that we needed to gain more scientific knowledge by reading, experimentation, and by studying our environment under capable community guidance. To meet this need the group set up their program for the following year. This program included field trips, excursions to places of interest, demonstrations by members of the group, by high school teachers and other capable people. The first two meetings of the second year took the form of field trips for the purpose of becoming acquainted with native trees, shrubs and flowers.

It was agreed that a special laboratory would be desirable. Certainly there should be a place for the storing of materials, and heat and light should be available. In the course of some experiments the need might arise for such things as gas jets, electric current, etc. However, these could be obtainable elsewhere so that experimentation need not be confined to any one place. The aim should be to utilize the total environment to the greatest possible extent.

Since we had accepted a philosophy of education

Activities in Elementary Schools

Arlington County school children at work in their garden.

Pupils of six grade working on product map of U. S., Nellie Custis School, Arlington County.

Fairfax County, first grade children working on garden unit.

Geography period, sixth grade, Nellie Custis School, Arlington County.

Activity period in the third grade, Nellie Custis School, Arlington County.

Models made by sixth grade pupils, Nellie Custis School, Arlington County.

which seeks to develop each individual on the basis of his own interests and capacities in relation to the total situation, we were unable to set up minimum essentials. We felt that it is the teacher's responsibility to guide children and to create about them situations rich in stimulating possibilities so that each child will be challenged to grow in his ability to interpret and use scientific information.

After prolonged discussion the group decided that only a limited amount of equipment was necessary or even desirable at this stage of our growth. This equipment should include a microscope, some hand lenses, a few simple chemicals, and a small number of other inexpensive materials. We found the State Course of Study very suggestive in this connection, and many of the materials needed for simple experiments are already available either in the school or at home.

At the beginning of the study, several members felt that the Centers of Interest prescribed limitations which are detrimental to the science interests of children at the age level for which the center is the area of study. As we progressed the group began to feel that the areas are sufficiently broad and stimulating if the proper interpretations are made.

The session ended before we got around to discussing the techniques of evaluation of outcomes in science in detail. Accordingly little was done except to agree that among the criteria there would be (1) the child's expanding interest, and (2) the meeting of new situations in which the experience gained actually became functional.

In evaluating the work of the year the teachers all reported that their children were showing a greater and greater interest in science. There was more curiosity with regard to the scientific phenomena about them and they were enjoying science activities in their leisure time. They appeared to be observing and using their environment more efficiently and their powers of observation and understanding have grown. Through experimentation and testing, they seem to have developed a sense of reality and are therefore assuming a more scientific attitude toward the solution of problems.

During recess, pupils frequently visit other classrooms in which science activities are in progress. They question both teacher and pupils about the work and have appealed to their own teachers for help in carrying on such work. The children have been active in bringing in science materials and asking questions about them.

As a direct result of our study the school board has come to our assistance and provided some equipment for elementary science, and in those schools having high school laboratories both the laboratories and teachers of science have been made available for the work in elementary science.

All-Expense Summer Tour to the Pacific Coast

Including Attendance Annual Convention, National Education Association
San Francisco, July 2-6, 1939

The Official Tour for 1939 will leave Virginia June 24 and will take us on a Circle Tour of the Northwest and Southwest, including such points of unusual interest as Chicago, Glacier National Park, Seattle, Portland, Columbia River Highway, Bonneville Dam, Multnomah Falls, San Francisco, The Golden Gate International Exposition, Los Angeles, Hollywood, El Paso, Juarez, Mexico, and New Orleans. The all-expense-paid costs, as shown, include rail and Pullman fares, rooms with twin beds and bath (two to a room) at the best hotels, including stay in San Francisco, the Convention City, sightseeing and motor tours, tips and transfers. All meals are included except while in San Francisco attending the N. E. A. Convention. Special air-conditioned Tourist Pullman Sleeping cars will be provided for the trip, which will consume 21 days.

Very attractive rates have been secured, varying according to accommodations and starting points, from $268 to $300. The tour will be limited to sixty persons. Already we have received a half dozen or more reservations. Persons interested in joining this tour should write to—C. J. Heatwole, Conductor, 401 North Ninth Street, Richmond, Virginia.

DEPARTMENT OF SECONDARY SCHOOL PRINCIPALS

Conducted by **L. F. ADDINGTON**
Principal, High School, Wise

HUMANIZING PHYSICS

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THE above title would be more nearly correct were it to read Humanizing Physics and Teachers, for wherever physics proves to be an unpopular subject it is usually the fault of the teacher through his method of presenting the material. We have even heard of teachers who believe physics is a subject to be taught from a recommended text with a certain number of experiments taken from a recommended laboratory manual which must be completed in a specified number of minutes with the use of certain specified equipment. At the same time, in case there should be any life left in a group of students after such treatment, these teachers believe that a concentrated dose of problems should utilize the remaining spark of energy. The reason for such a belief is hard to understand but perhaps we can blame it on the way their teachers before them "taught" physics, or perhaps, it is just the path of least resistance.

If, however, the teacher can reply to the question, "Why am I teaching physics?" that he believes a knowledge of simple, everyday physics is necessary for everyone who would live intelligently in our modern world of science, and that he believes that every person of high school age with average intelligence and a medium amount of work can secure this knowledge through proper instruction, he has taken the first step toward humanizing himself.

The second step consists in taking inventory of himself, his students, his school, and his community. He should determine what they can furnish which will be of practical use to the individuals who make up his classes. A teacher needs information about his subject. Thus, if a self-inventory shows a decided need in any particular field, he must plan to meet this need by outside reading and study. The average teacher who finds that his previous training has been for the most part an academic one of theory only must try by observation and work to fit the theories into practical everyday usage. His everyday use of ordinary appliances in his home, automobile, and school will furnish him with dozens of examples of the practical uses of physics. Jotting down these examples on cards will not only furnish a never ending supply of material but will train the teacher to observe more closely what is happening around him.

His own students will prove a veritable gold mine of information. A simple questionnaire properly

Examining life in a pool.

worded will soon tell him which boy can drive an automobile or tractor, take pictures, build model airplanes, build or repair radios, play a musical instrument, or take part in the dozens of other activities which make up his daily life. It will also tell him their plans for the future. Which student would like to be a farmer, a doctor, or an aviator? The father's occupation will also give a lead to possible sources of interesting information. With such information, it is possible to tie up the physics as taught with the physics as used by the student and to give him information which will be of value to him in pursuing his occupation or hobby.

The water, heating, ventilating, and lighting systems of the school offer hours of profitable study. Such equipment as the piano, radio, and school moving picture machine will meet other needs. The school bus or even a student's old dilapidated model T will furnish more examples of the applications of physics than the average teacher could attempt to explain in several months of study.

There is no community which in itself will not furnish a multitude of everyday applications of physical principles which are used but not understood by the people who use them most. The objects themselves are familiar to the user and the method of using is known, but why they work is a mystery until the physical laws and theories governing them are studied. This in itself is an advantage, for there is no new or unfamiliar apparatus to lead to complications.

We can still hear the teacher saying, "What of my textbook, my laboratory work, and my problems?" The student will need not only his own text but others as well, and a more general use of the library to secure the information he needs to answer the questions which will arise. Many questions will have to be answered as a result of the students' observation and work on the equipment supplied. The teacher, in turn, will find himself planning his laboratory work so as to answer these questions as adequately as possible with the use of the equipment and time at his disposal. As a result, problems and questions will be found to arise naturally and in a quantity sufficient to keep the most aggressive student on his toes.

Many teachers will not make the attempt to humanize their physics course. Those who do will find that it requires hours of work and involves many disappointments. However, the realization that the students leave the class with a practical and valuable knowledge of physics and with a real respect for their teacher will prove to be a source of never ending satisfaction to the "humanized teacher".

A STUDY OF THE ELEMENTS AND PROOFS OF PLANE GEOMETRY

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IT is the purpose of Part I of this study to make a collection of items of plane geometry from selected sources, and by the application of a statistical technique to assign a numerical value to each of them indicating its relative importance for a course in high school plane geometry. No effort is made to discover a list of items which are to be considered fundamental to such a course. Rather, the findings are intended to provide geometry teachers with a ranked list of items from which they may select content for their courses. The ranked list enables them to make their selection include the most important items.

There are seven steps used in the procedure for arriving at the ranked list of items. In step I the eighteen contributing sources of data are selected. These are chosen, in agreement with stated criteria, from five types of sources, *viz.*, syllabi resulting from group or committee deliberations, syllabi resulting from individual authoritative opinion, syllabi weighting the items on the basis of use in theorems of a specified list, syllabi appearing in selected city and state courses of study, and modern geometry textbooks. The second step is the tabulation of the 452 plane geometry items found in these eighteen sources. In the tabulation the items are classified under seven headings, *viz.*, assumptions or theorems for informal treatment, fundamental theorems, supplementary or subsidiary theorems, fundamental constructions, supplementary constructions, corollaries, and applications, as they were placed in the sources.

The assignment of a weighting to each of the seven types of items is step IV of the procedure. The next step involves a similar assignment of weighting to each of the eighteen sources. This weighting is made upon the basis of the judgment of thirty-two persons considered qualified to express an opinion in a study of this kind. The judges were selected

from five groups, *viz.*, high school mathematics teachers, graduate students in education, specialists in secondary education, specialists in the general field of professional education, and college teachers of mathematics. The median weightings given the seven types of items by these judges placed them in the following order of importance: fundamental theorems, assumptions and theorems for informal treatment, applications, fundamental constructions, supplementary theorems, supplementary constructions, and corollaries. The eighteen sources were given median weightings ranging from 8.0 to 14.0. One of the sources, *The Reorganization of Mathematics in Secondary Education, A Report of the National Committee on Mathematical Requirements,* is arbitrarily given the value, 12. The judges compared the other sources with this one.

In the fifth step the relative values of all items within each of the eighteen sources are determined. How this is done for one source, Reeve's *Tenth Year Mathematics Outline,* illustrates the procedure followed in the other sources. The tabulation of the items appearing in Reeve's outline revealed sixty-three items classified as fundamental theorems, forty-two as assumptions or theorems for informal treatment, seventeen as fundamental constructions, and forty-three as supplementary theorems. Obviously, the sixty-three fundamental theorems should all be given the same relatively high value since the judges placed this type of item first in value among the seven types. In all, there are 452 items tabulated from the eighteen sources. Consequently, each of the sixty-three fundamental theorems found in Reeve's outline is assigned a value equal to the average of the first sixty-three ranks from 452. This included the ranks through the 390th. The average of these ranks is found to be 421. This number is then multiplied by fourteen, the weighting for Reeve's outline. This product, 421 x 14, is found to be 5,894. Accordingly, this number is given to all sixty-three fundamental theorems found in Reeve's outline.

Similarly, each of the forty-two assumptions and theorems for informal treatment found in this source is given an average of the ranks from 389 through 348. This average rank is found to be 386.5. The product of this number by fourteen gives 5,159 which is assigned to all forty-two assumptions and theorems for informal treatment found in Reeve's outline. Each of the seventeen fundamental constructions in this source is given a relative value of 4,746. This number is the product of fourteen and 339, the average of the ranks from 347 through 331. Finally, each of the forty-three supplementary theorems found in Reeve's outline is given a relative value of 4,326, which is the product of fourteen and 309, the averages of the ranks from 330 through 288.

Since there are only 165 items tabulated from Reeve's outline, 287 of the 452 items contributed by all eighteen sources were not mentioned by him. In none of the sources did more than 282 of the 452 items appear.

The proposition is established that each of these unmentioned items in each source must have the same relatively small value for that source. This value is determined by getting the average rank of the unmentioned items starting with the figure representing the number of unmentioned items and continuing through one. Thus in Reeve's outline there are 287 of the 452 items not mentioned. These are given an average of the ranks from 287 through one, or 144.0. This average rank multiplied by fourteen, the weighting for the source, gives 2,016. Therefore, this number is given to each of the unmentioned items in this source. In exactly the same way the unmentioned items in each of the eighteen sources are assigned relative values.

The determination of the aggregate values of each of the 452 items is done in step VI. This is accomplished merely by adding the eighteen relative values for each item. These aggregate values are considered too large for easy interpretation. Accordingly, in step VII these aggregate values are converted into percentages of the aggregate value an item would have received had it been given the highest possible relative value in all of the eighteen sources.

The forty theorems found in Part I of the study to have the highest final relative value are selected for further study in Part II. Fifteen of these are taken from Book I of plane geometry, thirteen from Book II, seven from Book III, four from Book IV, and one from Book V. None has a relative value in per cent lower than 85.0.

Seventy-eight sources are examined to find proofs for these forty theorems. Most of the sources are textbooks, ranging in date of publication from 1781 to 1935.

At least two proofs are given for all but four of the theorems, and for one, the Pythagorean theorem, twenty-eight proofs appear. In all, 173 proofs are

described. These forty theorems, with the final relative value in per cent given to each of them, are given in the list that follows.

Book I

If two parallel lines are cut by a transversal, the alternate interior angles are equal. 99.9.

If two sides of a quadrilateral are equal and parallel, the figure is a parallelogram. 98.5.

If the opposite sides of a quadrilateral are equal, the figure is a parallelogram. 98.2.

Two lines are parallel if they form equal alternate interior angles with a transversal. 98.0.

The sum of the interior angles of a triangle equals 180 degrees. 97.1.

If two sides of a triangle are equal, the angles opposite are equal. 93.0.

If a series of parallels intercept equal segments on one transversal, they intercept equal segments on all transversals. 92.6.

If two angles of a triangle are equal, the sides opposite are equal. 91.9.

Two triangles are congruent if they have three sides of one equal respectively to three sides of the other. 91.2.

Two right triangles are congruent if the hypotenuse and a leg of one equal respectively the hypotenuse and the corresponding leg of the other. 91.2.

Two triangles are congruent if they have two sides and the included angle of one equal respectively to two sides and the included angle of the other. 90.9.

Two triangles are congruent if they have two angles and the included side of one equal respectively to two angles and the included side of the other. 90.6.

Two straight lines perpendicular to the same line are parallel. 86.5.

A perpendicular to one of two parallels is perpendicular to the other also. 86.1.

The opposite sides of a parallelogram are equal. 85.9.

Book II

An inscribed angle is measured by one-half its intercepted arc. 99.9.

A diameter perpendicular to a chord bisects the chord and its arc. 97.0.

The locus of points equidistant from two given points is the perpendicular bisector of the segment joining them. 94.6.

A tangent to a circle is perpendicular to the radius drawn to the point of contact. 93.3.

In the same or equal circles, equal chords are equidistant from the center. 93.1.

An angle formed by a tangent and a chord is measured by one-half its intercepted arc. 91.6.

In the same or equal circles equal central angles have equal arcs. 90.4.

In the same or equal circles equal arcs have equal chords. 90.1.

In the same or equal circles equal arcs have equal central angles. 89.9.

In the same or equal circles if chords are equidistant from the center, they are equal. 89.9.

In the same or equal circles equal chords have equal arcs. 89.8.

If a line is perpendicular to a radius at its point on the circle, it is a tangent. 89.8.

Parallel lines intercept equal arcs on a circle. 86.0.

Book III

If two triangles have an angle of one equal an angle of the other and the including sides proportional, the triangles are similar. 98.2.

In a right triangle the square upon the hypotenuse equals the sum of the squares upon the other two sides. 95.4.

If a line divides two sides of a triangle proportionally, it is parallel to the third side. 94.5.

If two chords interesect within a circle, the product of the segments of one equals the product of the segments of the other. 90.2.

If a straight line joins two sides of a triangle and is parallel to the third side, it divides these two sides proportionally. 89.2.

If two triangles have their sides respectively proportional, they are similar. 88.6.

In any right triangle the altitude on the hypotenuse divides the triangle into two triangles that are similar to the given triangle and to each other. 88.3.

Book IV

The area of a parallelogram equals the product of its base and altitude. 98.0.

The area of a triangle equals one-half the product of its base and altitude. 95.4.

The area of a trapezoid equals one-half the product of its altitude times the sum of its bases. 90.8.

The areas of two similar triangles are to each other as the square of any two corresponding sides. 85.2.

Book V

The area of a regular polygon equals one-half the product of its apothem and its perimeter. 87.5.

Chemical Industries of Virginia

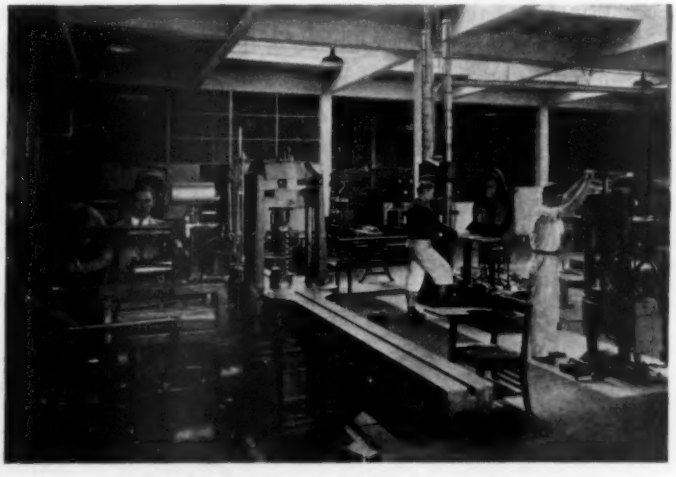
EDWIN COX, *Phosphate Products Corporation, Richmond*

AT Jamestown, in 1608, the colonists of Virginia established the American Chemical Industry. "Eight Poles and Dutch" operated a small glass house and the ship's manifest of the first exports of the colony listed "trials of pitch and tar, glass, frankincense, and wood ashes". In 1620, iron, salt, and leather were produced, and in the following year Italians were brought to the colony to operate a new glass house. In 1744, a paper mill successfully operated. In the early days chemistry was in overalls supplying the simple needs of the colonists. The first patent issued covered a process for the recovery of potash from wood ashes. The needs of the nation's infant industries in part influenced the practical Washington in his statement, "There is nothing which can better deserve your patronage than the promotion of science".

In 1866, the value of the chemical industries of the nation amounted to sixty million dollars, today the annual output of the industry for the country is in excess of eleven billions dollars in value. In Virginia, the industry has developed and now constitutes 40 per cent of the Commonwealth's capital plant investment, pays 20 per cent of the salaries and wages, and employs 16 per cent of the persons gainfully employed in industry. The products of the industry have promoted the more abundant life far more than any feats of political legerdemain. In the future, without throwing discretion to the winds, it is certain that new products of the industry will contribute to a richer life and at the same time reward its workers so that they may enjoy it. The chemical industry is a great democratizer and based on the economic principle of increased production and lower costs will not permit its products to remain luxuries, nor deny them to all classes.

The chemical industry within Virginia is diverse. Its products of greatest value are those produced from raw materials of agricultural origin, and the industry's consumption of these products not only increases the industrial wealth of the State but also increases the markets for the farmer. The recently adopted National Farm Bill calls for the creation of four great regional laboratories within the country to develop further the industrial uses for agricultural products, and it is to be hoped that the diversity of the chemical industries of Virginia using agricultural products as raw materials will influence the establishment of one of these laboratories in Virginia. Heavy chemicals, compressed gases, and chemical industries based on mineral resources as well as service industries and many special processes contribute to the total values created by the chemical industry as a whole. The various operations can be surveyed only briefly in this general summary.

Cellulose industries converting wood, cotton, and their pulps into chemical products are the largest group of chemical industries, and of this group rayon production leads in value and in number of employees. A substantial portion of the world's output of rayon is produced at the Virginia plants. The units at Roanoke, Covington, and Amphill use the viscose process, the Waynesboro operation uses the acetate process, and the Hopewell operation, formerly nitro, now on a reduced scale uses both nitro and viscose processes. In rayon manufacture cellulose as wood pulp or cotton linters is dissolved in chemicals and then the solution is expressed through small apertures and precipitated in chemical baths forming the valuable synthetic fibres. In a very similar op-



Materials testing Laboratory at V. P. I.

eration at Amphill and Fredericksburg the solutions of cellulose are not formed into threads but into sheets for use in the ubiquitous cellulose wrapping. A new rayon plant is now being constructed at Front Royal, and another is planned for Pearisburg.

The chemical industry of Virginia produces large amounts of wood and cotton linter pulp, but little is used to supply the demand of its rayon plants. The largest cotton cellulose plant in the world is located at Hopewell and converts cotton linters into cellulose for use not only in the rayon industry but for the production of explosives, lacquers, plastics, and many other products. Wood pulp plants at West Point, Franklin, Hopewell, and Covington use the Kraft (sulphate) process to convert pine woods into sulphate pulp. At Covington the pulping operations use the Kraft and also make the soda and sulphite pulps processes. At Lynchburg and Buena Vista pulps are made from the spent chips from tanning extract plants and other woods by modified soda processes. At Bristol there is a large soda pulp mill, and at Big Island and Coleman's Falls the pulp operation is a unique adaption of chemical and mechanical processes. A new pulp plant is being constructed at Jarratt in the middle of the southside pine belt. Paper mills at Covington, Buena Vista, Lynchburg, and Big Island produce many types of papers from the pulps produced at these points. At West Point, Hopewell, and Franklin strong Kraft papers and board are produced from the sulphate pulps. In addition to these paper mills operating in conjunction with pulping plants, two mills at Richmond produce wrapping, blotting, and specialty papers from pulp and alpha cellulose, and other mills at Richmond and Winchester convert waste paper into paper board. The oligarchy of cellulose which has overthrown King Cotton includes Virginia in its domain.

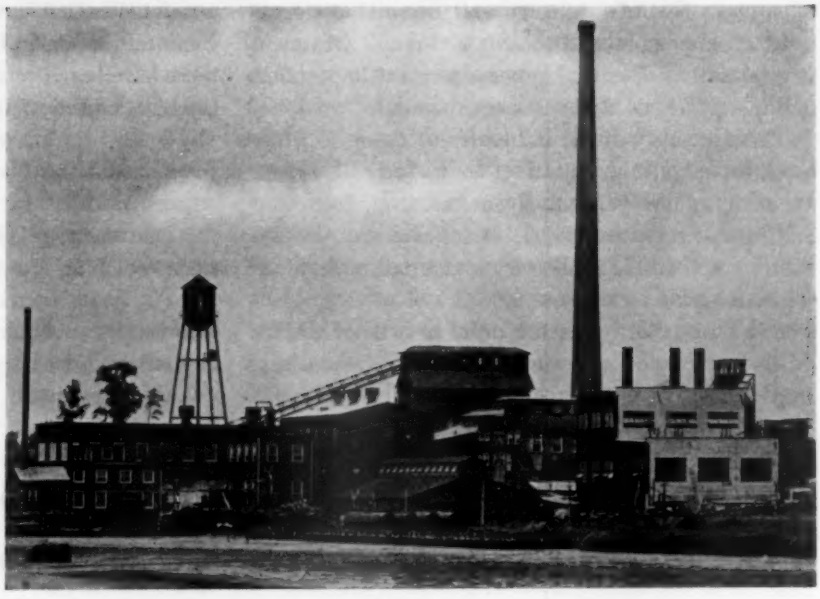
As adjuncts and by-products of these cellulose industries there are plants at Roanoke and Amphill producing carbon bisulphide, the solvent for pulp for viscose rayon and cellulose sheeting, and several of the wood pulp operations have by-product plants recovering turpentine and naval stores, and a wood oil.

The chemical industry of the State produces a variety of oils and fats from farm products. Peanut oil is made at Suffolk, soya bean oil at Portsmouth, cotton oil at Portsmouth, fish oil at a number of plants on the peninsulas on the western side of the Chesapeake, and refining plants at Norfolk and Richmond handle a wide variety of oleaginous materials. The pomace left after the extraction of the soya bean oil supplies a protein widely used for plastics, sizings, and paints. Other agricultural crops are the raw materials for the chemical industry of the State. Nicotine for use as an insecticide is produced from the by-products of the tobacco industry at Richmond. Tanning extracts are made at Lynchburg and Buena Vista, and the spent wood then converted into pulp for paper mills. Carotene, the Vitamin A precursor, is made commercially at Alexandria. Sumac extract is produced at Milford. Fruit by-products are manufactured at Winchester, Waynesboro, Strasburg, and Harrisonburg and afford the orchardist a market for his surplus. An interesting operation at Richmond produces for medicinal use beef, liver and spleen extracts, and here also an interesting small operation raises digitalis and then extracts the alkaloid. Similar small operations throughout the State for other products would encourage pharmaceutical farming.

The fertilizer industry of the State produces approximately ten per cent of the commercial plant foods of the nation. There are 42 plants of which over half are at Hampton Roads ports, and others are at Richmond, Alexandria, Danville, Petersburg, and Lynchburg. Eleven of these plants produce superphosphate, the basic fertilizer ingredients, while the other units mix and blend plant foods only. The great nitrogen fixation plant at Hopewell is a backbone of the domestic plant food industry. Nitrogen from the air is fixed as ammonia and then oxidized into nitric acid and from this acid sodium nitrate is produced. This operation serves efficiently as the ploughshare of peace freeing the nation from the domination of imported nitrates, yet is an effective bulwark in national defense.

At the Hopewell nitrogen fixation plant, liquid ammonia is produced for use both in the manufacture of plant foods and many industrial purposes. Liquid chlorine is made by an interesting new process and for use in bleaching pulps for the cellulose industry, in the textile field, for sanitation, and in a variety of industrial processes. By-product hydrogen and oxygen are manufactured by the cotton oil plant at Portsmouth. Oxygen is also produced at Norfolk, Richmond, Newport News, Roanoke, and both hydrogen and oxygen at South Washington. Compressed

carbon dioxide gas is made at Norfolk and Richmond. The refrigerant gases sulfur dioxide and methyl chloride are produced at Port Norfolk. In addition to these industrial gases fourteen plants throughout the State produce gas for household and industrial use which is an important chemical industry of the State. Acetylene gas is made at Richmond, South Washington, and Newport News. Calcium carbide, the raw material for the manufacture of acetylene, is made at Ivanhoe. This process is of interest to Virginians, as the first commercial operation after Willson's development of this interesting chemical at Spray, N. C. was at Holcomb's Rock, Virginia.



Pulp and Paper Mill of the Chesapeake Corporation at West Point, Va.

The salt industry started in the infancy of the colony, and later moved west with the discovery of the sedimentary salt beds. The commercial production of salt at Saltville began in the eighteenth century and in 1893 there was constructed the first alkali plant in the South. Salt is the raw material and from it is produced soda ash, caustic soda, and bicarbonate of soda. Dry ice (solid carbon dioxide) is produced as a by-product. The complementary heavy chemical to alkalies is sulfuric acid. Eight of the fertilizer plants of the State produce this acid for their own use and for the commercial market. There is a large sulfuric acid works at Pulaski which is the only plant producing this acid from the ore, pyrrhotite. A contact sulfuric acid plant at Piney River produces acid for use in the process of that operation.

At Piney River, nelsonite ore is mined, and by chemical processes converted into titanium paint pigments. A by-product of the process is monocalcium phosphate. At Pulaski and Bedford ores are refined and purified for pigments. Paint and varnish industries are located at Richmond, Norfolk, and Roanoke. Other plants producing chemicals from our mineral resources are mica plants at Richmond, rutile operations in Nelson County, talc operations in Bedford, and a zinc plant at Wythe County. Cement is manufactured at Fordwick and Norfolk, and plaster products at Plasterco and Saltville. There are numerous lime plants throughout the Great Valley of Virginia producing that important industrial chemical.

Tanneries at Buena Vista, Bristol, Bluff City, Iron Gate, Salem, and Big Stone Gap; rubber plants at Winchester and Bedford; and wood preserving plants at Norfolk, Portsmouth, and Radford add to the diversity of the chemical industries of the State. Dyes are produced at Damascus, and dyeing works at Richmond and Waynesboro as well as in many of the large textile operations of the State are complex chemical processes. Bleach solutions are made at Richmond, Hopewell, and Norfolk. Veneer operations based largely on chemical adhesives are at Portsmouth, Norfolk, and Pulaski.

The largest baking powder plant in the South is at Richmond. Here also is one of the country's largest manufacturers of flavors and extracts. Breweries at Richmond, Norfolk, and Roanoke, and distilleries at Richmond and Fairfax are chemical industries and successors to the domestic plant of Captain Thorpe who early in the 17th century on the banks of the James found that he could make such a delicious drink of Indian Corn that even the water mixed with it became potable, and English ale tasted flat. Dry cell chemical batteries are manufactured at Appomattox. At Richmond, metal foils are rolled from alloys, and here and at Norfolk bearing metals are alloyed and moulded. Electroplating is the field

of a large Norfolk industry and in smaller operations at other points in the State. Water treatment is essentially a chemical process of great importance to our welfare, as is also sewage disposal.

This summary of the industries of chemical processes throughout the State does not include all. There are many others particularly in the drug, food, and mixing and compounding fields. There are other industries still in the laboratory and small scale plant stage that will create new wealth and offer employment in the future. As the rapid growth of the industry has created new wants, it has also created new employment. The branches of the industry are interrelated so that the growth of one field creates other chemical opportunities. In its rapid development there have been oversights. It is an anachronism that the by-products of the industry should sometimes be physically disagreeable and the industry must care for its industrial offal. There is no excuse, socially or economically, for chemical industries to resemble the instruments of Prester John "images of fearful mien belching forth flame, smoke, and noisome fume". With increasing maturity these defects will be overcome and the chemical industry will continue to contribute to the common weal of the Commonwealth economically, industrially, and sociologically.

Virginia's Present Contributions To Science

D. MAURICE ALLAN, *Hampden-Sydney College*

VIRGINIA does not loom large in the headlines of scientific discovery. She has no highly endowed research foundations set up by corporate wealth or private fortune. Her universities cannot compare in size or endowment with Harvard, Columbia or Chicago. She has no great metropolitan dailies to play up the latest findings of her laboratories. Yet, despite all this, there is excellent evidence that our State is not in the rearguard of the onward march of science in the nation. It has been computed that there are over 1,700 scientists in the State of Virginia who are either teaching, directing or personally engaged in scientific research. The majority of these are connected with the colleges and universities of the State. Some two or three hundred are employed by the leading industries of the Commonwealth to keep abreast of the latest advances in science or to perfect their own processes.

D. Maurice Allan

Virginia's scientists, despite their lack of costly equipment, number among them some of the ablest in the country. Thus in the 1933 edition of *American Men of Science,* Virginia was shown by tabulation to be seventeenth among the states in her contribution to the "starred list" of distinguished American scientists. This ranking is on the basis of three representatives on the list: Beams in Physics, Kepner and Speidel in Zoology. By the same test, Virginia leads the other Southern states with the exception of Texas. Of Virginia's representation in *Who's Who in America,* 106 or 18 per cent of the total are men of science, including the medical scientists. This is an unusually large percentage and is probably exceeded by only a few states.

In the special branches of science, we can mention only a few of the leading pieces of research conducted in the State in the past two or three years. In Physics, Dr. J. W. Beams is internationally known for his development of the vacuum type ultracentrifuge. This instrument whose incredibly high speeds of rotation can shatter the strongest materials known has been applied with success to the difficult task of separating isotopes. It has also given great promise as a tool of research in the chemical, medical and biological sciences. For example, it has been used successfully to concentrate the virus of yellow fever. Another valuable line of work in the same field is Dr. L. B. Snoddy's research in high electrical breakdown in gases which has thrown much new light on the nature of lightning, the aurora borealis and similar natural phenomena.

The splendors of the night sky and the mysteries of interstellar space have been diligently explored by our astronomers. In this field honor has been brought to the State by the work of Dr. S. A. Mitchell. As scientific head of the solar eclipse expedition of the National Geographic Society and the U. S. Naval

Observatory at Canton Island, Dr. Mitchell took important photographs of the sun's chromosphere and corona which, among other discoveries, disclosed twenty new lines of the Paschen series of hydrogen. The Leander McCormick Observatory at the University of Virginia last July completed and published a study of the proper motions of 18,000 faint stars. A no less colossal task has been the measuring of the distance of over 1,300 stars by astronomers of the same observatory.

Wandering over the mountains and valleys of Virginia, our geologists have assiduously gleaned new knowledge about our mineral resources. In the latest edition of the Bibliography of North American Geology for 1935-1936, there are 77 titles of papers on Virginia Geology alone. A leading geologist of our State has listed the following as just a few of the more valuable ones: "Papers on William Barton Rogers, First State Geologist, by J. K. Roberts and Arthur Bevan, a bulletin on the James River Iron and Marble Belt by A. S. Furcron, studies of the Barite deposits of the State by R. S. Edmundson, the Zinc and Lead region of Southwest Virginia by L. W. Currier, Virginia's Mineral Contribution to the Confederacy by R. S. Boyle and the origin of the Valley Travertine deposits by Edward Steidtmann."

In the chemical laboratories of our State, perhaps the most distinguished work has been done by Dr. John H. Yoe who is directing at the University of Virginia one of the most comprehensive investigations in analytical chemistry ever undertaken. He is the inventor of the photoelectric colorimeter and the roulette comparator, valuable instruments for refined analysis of high accuracy. His two-volume work, Photometric Chemical Analysis, is authoritative in this field. In bio-chemistry, the work of the Drug Addiction Laboratory at the University is outstanding. Dr. L. F. Small, the director, and his associates have been engaged in a most exhaustive study of anesthetic and narcotic drugs leading to the discovery of new pain-destroying compounds without habit-forming or other harmful effects to the human organism. A former president of the American Chemical Society, Professor M. T. Bogert, at a meeting of the Society stated that Dr. Small and his work would be gratefully remembered long after the members of the audience and all their work had been forgotten.

Virginia has many tireless investigators in the medical sciences. Dr. C. C. Speidel has received national recognition and many awards for his investigations, especially his motion-picture studies of nerve growth and development which have greatly illumined the mysterious processes by which nerve cells grow and degenerate. Dr. H. E. Jordan, a histologist of distinction, has made important studies of the origin of the blood cells and other problems of the reticuloendothelial system. Dr. Chanutin's work on kidney functions, Doctors Wood and Cash's studies of renal and arterial pressure relationships, Dr. Britton's studies in functions of the adrenal and pituitary glands, Dr. Apperly's investigations of blood-chemistry in relation to anaemia and the effects of altitude and Dr. Main's studies of carbon dioxide in relation to body-build are among many investigations of value to science and humanity.

Our psychologists have been exploring the intricacies of the human mind with new and refined techniques. Dr. Sollenberger has made a fine study of manual tremor in which he used for the first time a recording system free from inertia and hence has come nearest to a "true picture" of tremor yet attained. Dr. Wallace has thrown valuable light on interdependence phenomena in vision. Dr. Schoen has developed a new chronometric method of testing eye muscles. Doctors Geldard, Gilmer and Weitz have made some very significant investigations into the vibratory sensitivity of the skin. Going back a little further, Dr. Dennis made some valuable motion picture studies of infant behavior that have cast much light on the "instinct versus learning" controversy.

In the various biological fields, research of a high order has been progressing in our State. Dr. O. E. White, director of the Blandy Experimental Farm, is a distinguished geneticist who has made valuable contributions to our knowledge of the nature of the chromosomes of many plant species. Dr. W. A. Kepner, in addition to his prolific studies of protozoa and flat worms, is a leading American vitalist who has focussed scientific attention on the purposive adaptations of animal life. Dr. I. F. Lewis is a botanist of distinction who has rendered a great service to our State by founding and building up the school of biological research at Mountain Lake, with its unique panorama of very varying habitats.

Professor A. B. Massey, of the Virginia Polytechnic Institute, perhaps the leading taxonomist of the State, has with his associates conducted a most extensive survey of the flora of Virginia.

These are but a few glimpses to remind us that night and day Virginia scientists are busy exploring in the name of truth the fascinating world in which we live.

Virginia and Science

AUSTIN H. CLARK, *Smithsonian Institution Washington*

SCIENCE—organized knowledge—forms the background of history. Even the most primitive tribes living by hunting and by fishing must have a detailed and exact knowledge of the habits of the animals and of the characteristics of the plants upon which they depend for their existence. They also must know more or less about the rocks from which they make their arrowheads, spear-points, and other implements.

Austin H. Clark

This knowledge they acquire through careful observation, and by experience. It is not, like the great bulk of modern science, the result of planned research, yet it is organized knowledge just as truly.

More complex social systems are developed hand in hand with a broader and more extensive application of scientific principles, especially in the physical sciences, as we see, for instance, in ancient Egypt and in Rome. The social structure of the present day and history in the making are dominated completely by the enormous extension of every form of applied science.

The early history of Virginia was determined very largely by that great geographical and geological feature known as the Fall Line, delimiting the coastal plain, to which all the early settlements were confined.

Up to the early years of the seventeenth century the English settlers attempted to apply in the New World the scientific background of Old England, with very indifferent success. They then began to develop methods in agriculture and in other forms of activity better suited to local conditions. The scientific method of approach was beginning to manifest itself. This was intensified in the last half of the seventeenth and the first half of the eighteenth century when the products and resources of the Colony were investigated in great detail by many different gentlemen.

The last half of the eighteenth century witnessed a great development in applied science. It was not enough merely to know what the country produced; it was essential also to know how to make use of these products to the best advantage. Science was becoming dynamic—building for the future instead of being content simply to contemplate things as they are. Dr. Small, of William and Mary, who assisted James Watt in the development of the steam engine, and his pupils, Thomas Jefferson, John Page, and others, were the great leaders in Virginia in this translation of science from the static to the dynamic aspect.

The rapid development of the steam engine marked a turning point in the social life, and hence in the history of Virginia. The influence of steam power was greatly increased in the last half of the nineteenth century by the application of steam to very many industrial processes and, following the urgings of Maury, by the building of railways and, through the application of recently developed engineering principles, of excellent roads in all directions. The rapid extension of telegraph lines and cables, and later of telephone lines, also played an important part. Railways and good roads—products of science—revolutionized the transportation system of the State; the waterways gradually lost their value as arteries of commerce.

And now we are witnessing the effects on the social aspect and history of the State resulting from the perfection of the gas engine and its rapidly increasing application to road and air transportation and to industrial uses of every description, and from the development of the radio.

Where will it lead us? That we cannot at this time foresee, so let us look into the past and trace the history of science in Virginia more in detail.

Elizabethan times in England, and in Europe generally, were marked by an awakened curiosity among the cultured and the learned classes. People were increasingly eager for more accurate and extensive knowledge of the things about them, and of the world in general. The people of England were especially anxious to learn all they could about that vast new world extending from French Canada to Spanish Florida that they called Virginia.

So it was quite natural that Sir Walter Raleigh should send out to Virginia in 1585 Thomas Har-

riott, mathematician and astronomer, one of the foremost scholars of his time and the first man of science to visit the Americas, to report on the new country.

In accordance with the wishes of Queen Elizabeth, the expedition also included an artist, John White. White again visited Virginia in 1587. While in this country he made numerous water color drawings of the Indians and of many kinds of plants and animals.

King James I took a personal interest in the natural products of Virginia, and by his example did much to further investigations.

Applied science had its first beginnings in Virginia in the reign of James I. In 1612, John Rolfe perfected a method for curing tobacco so that it would reach England in good condition, and as early as 1617 the idea of a rotation of crops was already beginning to take root.

Charles I, like his father and his friend George, Duke of Buckingham, was much interested in the natural history of Virginia, and even sent collectors to the Colony to gather specimens for him.

Modern science may be said to have begun after the Restoration in 1660, when Charles II in effect decreed that there is nothing irreligious in reporting facts. As a natural result of this, science passed almost at once into the stage of intensive development.

By this time Virginia had become well populated, and the description of the natural products and resources was undertaken by local residents. Among the outstanding local scientific men of that period were the three John Claytons, John Bannister, Mark Catesby, John Mitchell, and John Tennent.

By the middle of the eighteenth century interest in science was very general among the gentlemen of Virginia, and efforts were begun to form associations which had for their object bringing those with scientific interests into closer contact and also stimulating the development of applied science. So the "Society for the Promotion of Manufactures" was formed at Williamsburg in 1759, followed by "The Virginia Society for the Promotion of Useful Knowledge" in 1773.

Colonel Francis Fauquier, a man "of great scientific Interests and gentlemanly Pursuits in Learning," came to Virginia as Lieutenant Governor in 1758, and in the same year came Dr. William Small as professor of mathematics and natural philosophy in the College of William and Mary. Colonel Fauquier and Dr. Small delighted in the society of young men, and the brilliant youths of the Colony, among them Jefferson, Page, Walker and McClurg, with Dr. Small, were frequent guests at the Governor's table. Jefferson in later years referred to Dr. Small as the man who "fixed the destinies of his life," and John Page always referred to him in the most appreciative terms.

In 1769, the present "American Philosophical Society held at Philadelphia for Promoting Useful Knowledge" was established and Virginians interested in science were welcomed as members. In its early years the contributions of its Virginian members were many and interesting. Among the most important was a dissertation on "The Fly-Weevil that destroys the Wheat" by Colonel Landon Carter, presented through Dr. Arthur Lee in 1768 and printed in 1771. This was the first contribution to economic entomology published in America. In 1796, a letter from Jefferson was read describing the bones of the first known ground sloth.

Thomas Jefferson initiated the era of intensive investigation of the resources and natural products of the country, first in Virginia, and later on a nationwide basis. These investigations were carried out through organized surveys in the older states, and by special expeditions in the West. The first of these expeditions was that of the two Virginians, Lewis and Clarke, sent out by Jefferson himself.

The Geological Survey of Virginia was established in 1835 and was placed under the direction of Professor William Barton Rogers, of the University of Virginia, a graduate of the College of William and Mary, where his father had been a professor. Professor Rogers, a man of powerful and magnetic personality, carried on the work with great energy and skill until 1842. In view of his outstanding services to the State it is quite fitting that Virginia's highest mountain should be named for him.

He was chairman of the last meeting of the Association of American Geologists and Naturalists held at Boston in September, 1847, at which that Association resolved to broaden its scope and to assume the title of the "American Association for the Promotion of Science." This change was made at the meeting held at Philadelphia on September 20, 1848. Professor Rogers, opening the meeting, turned the chair over to Mr. William C. Redfield as the first president of the American Association for the Advancement of Science.

In more recent times the greatest name in science

in Virginia—indeed, in the whole United States—was Matthew Fontaine Maury. Professor Matthew Page Andrews says that the modern period of scientific promotion was introduced by Maury "who had, in 1868, given his attention to the material rebuilding of the State by inaugurating a physical survey designed to point out its resources and to show how the construction of good roads and railroad lines would help in developing its natural wealth. . . . His reports on Virginia insured attention and commanded respect, and to them was probably due the first considerable influx of northern capital."

Maury is remembered chiefly for his work in oceanography, in charting the currents, particularly the Gulf Stream, and the winds, and in sounding the ocean's depths, work that brought him honors from all the principal nations of Europe. He was mainly responsible for the organization of the Hydrographic Office of the Navy Department and the Naval Observatory in their present form, and was largely responsible for the creation of the Weather Bureau. The United States Naval Academy at Annapolis was in no small degree inspired by him—writing under the name of "Harry Bluff." But in spite of his broad interests and his fundamental work in connection with everything having to do with the sea, Maury was first and foremost a Virginian, and he spent the last years of his life as professor of physics at the Virginia Military Institute at Lexington.

Before closing this sketch of science in Virginia, I would like to point out that an unusual number of Virginia's governors were actively interested in science. Among these were Sir Walter Raleigh, Governor Proprietary, 1584-1603—chemistry; Captain John White, Governor, 1587—natural history; Dr. John Pott, President of the Council, 1629-1630—surgeon; Colonel Francis Fauquier, Lieutenant Governor, 1758-1768—science in general; Thomas Jefferson, Governor, 1779-1781—science in general; John Page, Governor, 1802-1805—physics and mathematics; and John Garland Pollard, Governor, 1930-1934—ethnology of the Indians.

The scientific tradition of Virginia, both as an English Colony and as the present Commonwealth, is second to none. The country looks to Virginia for further leadership and for further progress on the road to better understanding.

Virginia's Contribution To America's Men of Science

KENNETH B. M. CROOKS,
Hampton Institute

IN point of size (40,262 square miles) the Old Dominion ranks thirty-third among the states of the Union; in population, (2,421,851 in 1930) she is surpassed by nineteen other states; in agricultural exports ($170,000,497) nine other states exceed her figures for 1929; in total wealth ($5,665,000,000 in 1929) Virginia stands nineteenth and in per capita wealth ($2,347) she places thirty-sixth, ahead of thirteen other southern states. Yet the Commonwealth is most remarkably rich in her human resources, among which, from the beginning of our country's history, are well known the soldiers and statesmen, the political geniuses and public servants as well as preachers, inventors and scientists. From the very first these of the intelligentsia, and the politicians, plantation owners, professional men as well as their wives and daughters have always had a great interest in the progress of natural science. Though there were but few scientists of high calibre in the earlier days, out of the genuine and eager interest there has arisen a present group of scientists of national and international importance, a group of men and women of whom every Virginian may well be proud.

Whenever one wishes information on the scientists of our continent one must of necessity turn to Cattell's *American Men of Science* which has just gone through six editions, the last appearing in August, 1938. In this sixth edition of 1,607 pages there were listed over 28,000 carefully selected men and women, recognized as being scientists, "who have carried on research work in the natural and exact sciences . . . and who . . . represent work that has contributed to the advancement of pure science."

A study of the ponderous fifth edition (1933) showed that of the American scientists listed, 22,000 in all, 617—595 men and 22 women—were either

born or educated in Virginia or are now resident in this State and therefore actively pursuing their scientific careers here. This signifies that for every thirty-four American scientists one is a Virginian by birth, education or adoption. The increasing importance of women in the work of the world is also evidenced by the fact that there are twenty-two women in this group, that is, one woman scientist for every twenty-seven.

A number of studies have been made on scientists from other states and of the world, and a general comparison is easily possible, but because of the well known Shakespearean advice that "comparisons are odious" and since the ideals of a true scientist do not include comparisons that may smack of egotism we have chosen to record here none of the many comparative observations we have made concerning the relative contributions of the several states to the roster of America's Men of Science. Our study clearly shows that Virginia has made a most significant contribution to the scientific progress of the nation, and as it is now generally believed that the rapid changes of the last fifty years, our social evolution, the increase of life expectancy, the retreat of disease and pestilence and the decrease of poverty are all directly due to increase of scientific knowledge, we are happy to report here a few of our findings.

Of our 617 Virginian scientists, more than half (342 or 55.4 per cent) have degrees from Virginia institutions: 522 degrees in all, or rather more than a degree and a half per scientist. Table I below shows the distribution of these degrees according to rank and to the colleges awarding them. A study of the figures shows that of the 114 doctorates earned by our scientists, 90 were bestowed by the University of Virginia, almost the well known ratio of "four out of five." Of the 151 Master's degrees, the University granted 86 or 56.9 per cent, more than all the other institutions combined. Of the 257 Bachelor's degrees, the University awarded 88 or more than any other single Virginia college (34.2 per cent) and more than a third of the total. There is, of course, some overlap for several of the scientists after earning their first academic degree at some undergraduate college, moved on to the state university of Jefferson's dream to win their second and third degrees. Altogether the University awarded 264 degrees to these scientists (88 Bachelor's, 86 Master's and 90 Doctor's), the Virginia Polytechnic Institute 72 (13.8 per cent) and the others as shown in the Table.

Two hundred seventy-five of our Virginia scientists took their degrees at 137 different out-of-state institutions both in the United States and Canada as well as in Europe. The Johns Hopkins University leads with 105 degrees (11 Bachelor's, 12 Master's, and 82 Doctor's), more than twice as many as the nearest competitor, the University of Chicago with 49 (3 Bachelor's, 16 Master's and 30 Doctor's). Next in order come Columbia, 45, Cornell, 43, Harvard, 36, Wisconsin, 26, University of Illinois, Maryland and Princeton 23 each, Ohio State and Yale, 21 each, Minnesota, 17, Iowa and Michigan 16 each, Pennsylvania 11, and Pennsylvania State 10.

The average age of 601 Virginia scientists whose dates of birth were given was, as of January 1937 when this study was being completed, 49.51 years. At great risk of sudden and violent death we also calculated the age average for our women scientists and found that twenty had an average age of 46.9 years (S.D. 8.5), so that our female scientists at just 47 is slightly younger than her male coworker.

TABLE I

College Degrees of 342 Virginia Scientists

College	Bachelor	Master	Doctor	Total
University of Virginia	88 (34.2%)	86 (56.9%)	90 (78.8%)	264 (50.5%)
Virginia Polytechnic Institute	44 (17.1%)	27 (11.2%)	1 (0.9%)	72 (13.8%)
Randolph-Macon	31 (12.0%)	6 (4.6%)	3 (2.7%)	40 (7.7%)
Washington & Lee University	19 (7.8%)	12 (7.9%)	3 (2.7%)	34 (6.5%)
University of Richmond	24 (9.3%)	4 (2.6%)	2 (1.8%)	30 (5.7%)
George Washington	8 (3.1%)	9 (5.9%)	8 (7.0%)	25 (4.8%)
Hampden-Sydney	14 (5.5%)	1 (0.6%)	0	15 (2.9%)
Virginia Military Institute	12 (4.7%)	2 (1.3%)	0	14 (2.7%)
Roanoke	9 (3.7%)	2 (1.3%)	0	11 (2.1%)
William & Mary	7 (2.8%)	2 (1.3%)	0	9 (1.7%)
Medical College of Virginia	1 (0.4%)	0	7 (6.3%)	8 (1.5%)
Total	257	151	114	522

Of our entire group of 617 persons, 343 are native born Virginians, 82 are Southern (other than Virginia, 13.6 per cent), 97 are Northern (16 per cent), 56 are from the Midwestern states (9.2 per cent), 25 are of foreign birth (4.1 per cent), and only 4 hail from the Far West (0.6 per cent). This shows that though the Old Dominion has attracted 43.4 per cent of her scientists from other states and from foreign countries, she has kept more than half of her native sons. Strange though is it that there are more foreign born Virginia scientists than there are Far Westerners. But as the total state population at the 1930 census was 95.6 per cent native and only 1.4 per cent foreign born whereas 4.1 per cent of the scientists are foreign born we can clearly see that Virginia draws of the best from all the world.

Our study shows also that 114, exactly one-third of the 342 native Virginians, are still living in the State and therefore doing their creative work here, whereas two-thirds are dispersed on the North American continent in thirty different states as well as in many foreign countries, including Cuba, Hawaii and Panama. So then Virginia not only attracts scientists from the nation and from the world but she gives of her resources, too, and the whole wide world gains thereby.

We dare not enter into a discussion of the sixty-four scientific fields to which our scientists have made contributions, but among our workers we find 137 chemists, 63 mathematicians, 42 physicists, 30 zoölogists, 28 psychologists, 20 biologists, 19 botanists, 19 geologists, 18 surgeons, as well as men in aeronautics, anthropology, ceramics, electrical engineering, entomology, geodesy, mycology, neurology, physical chemistry, topography and actuarial science and many other subdivisions.

The editors of the *American Men of Science* have long had a custom of prefixing an asterisk to the names of a relatively few scientists whose work has been adjudged outstanding in the scientific world. Among our 617 Virginia scientists are 33 "starred" men—no women—that is, one distinguished man for every eighteen scientists. Twenty of these are Virginians by birth and the others, though not natives, are Virginians either by education or adoption. That all of those "starred" men who are still in Virginia, eight in all, should be connected with the State University is again significant and further tribute to the efforts of the untiring and immortal Jefferson, who, a scientists in his own right, was instrumental in bringing to Virginia two distinguished scientists of national reputation among their contemporaries, namely, Dr. John P. Emmett, professor of Natural History and Dr. Robley Dungleson, professor of Anatomy and Medicine at the University.

Twenty-one of these "starred" men are in the physical sciences, astronomy, applied electricity, celestial mechanics, chemistry, physics, geology and the like, and seventeen are in the biological sciences, such as anatomy, biology, botany, medicine, pathology, physiology and zoology. The average age of thirty of the "starred" men whose dates of birth are given is 61.6 years, (S.D. 12.2) which seems to indicate that since the average age of the whole group is 49 years, it takes a superior scientist more than twelve years of productive work to become of national importance, but this generalization should not be taken too literally for there is a great age range among the men, the youngest being hardly 39 and the oldest 86 years.

Finally, it is of interest to note that among these 617 American scientists in Virginia are at least five who are connected with institutions for the education of Negroes; three are located at Hampton Institute, and one each at Virginia State College for Negroes and Virginia Union University. The source of our information, of course, does not specify whether or not these scientists are Negroes. At all events, none of these five was born in Virginia and only one earned a Virginia degree.

The early interest in natural science has apparently not decreased in Virginia; instead it seems to have been intensified with the passing of the years. And so we find that the Old Dominion, which has in the past of her rich human resources given generously to the nation and to the world leaders in every field of endeavor, is today still aiding in the progress of civilization and the advancement of knowledge by reason of her creative men and women of science.

Because, in the words of the editors of the *American Men of Science*, "the number of scientific workers in America represents the enlarged place of scientific research in the modern world and the greater share taken by the United States, (which) has attained in a single generation a position of leadership among the nations in its contributions to the advancement of science and to human welfare," this little band of workers—these noble six hundred—is a group of Virginians of which we may all be proud.

This "Conservation Education"

CECIL F. DeLaBARRE, *President*
Virginia Wildlife Federation, Blacksburg

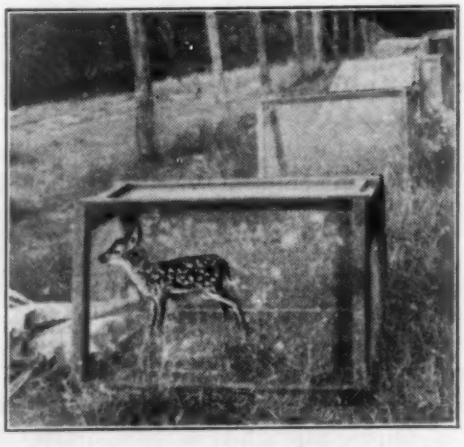
IMPATIENCE with delay is a typically American trait. It is probably responsible for the majority of our present-day conservation problems. Most of us want quick action; and, for example, if we see a fine stand of timber on some Virginia hillside under our jurisdiction, our hands itch for the feel of an axe so that we can convert trees into marketable sawlogs. In our hurry to convert timber into cash, we are quite apt to overdo the job, for we would rather act than plan. We dislike to take the time to plan our operations so that they will leave us with something from which we may draw dividends in the future. It is much easier to make a clean sweep and then move on to another hillside ripe for exploitation. The only trouble is that there are no more such hillsides available.

It is my firm belief that an understanding of the problems of wildlife restoration and conservation will lead to a better appreciation of the larger problems of conserving soils, forests, and waters, for all of these, wildlife included, are sustaining resources so inextricably tied up one with another that it is impossible to influence one without affecting most or all of the others. It is particularly significant that wildlife is so sensitive to changes in its environment, to the tinkering we may do with the soils and forests and water resources on which it is dependent, and which in turn are at least partially dependent on it. Maladministration of these renewable resources is often evidenced first by a decline in wildlife populations, and wildlife or the lack of it serves as a definite index to show us how we are managing those resources on which our whole civilization is based, for wildlife leaves mistreated lands before they become so sterile that they will not support men, and its departure means that there is danger ahead.

It is evident that conservation, or wise use, of natural resources is necessary if civilization is to continue. Civilization has been defined as man's control over his environment, but this definition does not imply that civilized man can do what he will with an acquiescent earth. It means rather that man can intelligently manage other animals, plants, and soils. provided that he has learned enough about them. No civilization ever endured which neglected or exploited to the full its natural resources. The Babylonians, the Egyptians, the Mayans, and finally the Chinese have given us evidence in plenty that misuse of the land brings disaster to nations.

The welfare of our wildlife resources is inevitably tied up with the welfare of the land, as is ultimately the welfare of man himself. Just as the canary birds which coal miners used to take with them into dangerous mines gave warning of deadly gases because they were affected sooner than were the miners, so wildlife gives us warning of land misuse before we ourselves may be conscious of it. That wildlife is thus an index as to the trend of land use, and ultimately of civilization, may actually be its chief value to mankind.

But there are other values of wildlife, both economic and esthetic. The United States Department of Agriculture estimates that insectivorous birds and other animals are worth more than $300,000,000 a year to American agriculture. Without them it is doubtful if crops could be brought to maturity. As an attraction to tourists and sportsmen, wildlife brings millions of dollars to rural sections. A survey recently made in a Minnesota county, considered by its residents as primarily agricultural since its farm products sold for $1,500,000 annually, disclosed that vacationists and sportsmen spent in the county each year an even greater total. The survey also disclosed that four out of each five dollars spent by the vacationists went ultimately to labor. What



One of the 25 fawns from Pisgah National Forest, North Carolina.

Teal leaving nest.

wildlife restoration can mean to Virginia communities was illustrated in Bath and Alleghany counties last fall, where business men, farmers, guides, and other residents received over $60,000 from 2,500 deer hunters during the five-day open season. Only one out of every twelve hunters was successful in bagging his buck, but each man spent about $25 in the community where he hunted, so that each deer bagged brought over $300 worth of business. Game management activities to be conducted under the provisions of the cooperative forest-wildlife program inaugurated last June by the U. S. Forest Service and the Virginia Commission of Game and Inland Fisheries should within a few years at least quadruple the income these counties receive from their wildlife resources. The Forest Service-Commission program is now in effect on all the 1,400,000 acres of Virginia lands in the George Washington and Jefferson National Forests. Extensive restocking of deer, turkey, beaver, and others species is planned, together with habitat improvements, control of dogs and other predators, intensive patrolling, and other wildlife management activities. After the deer, turkeys, and other game species increase to the point where they can be harvested without diminishing the permanent supply of wildlife on these lands, it is expected that the thirty counties within the National Forest boundaries will receive more than a million dollars additional income yearly from expenditures made by sportsmen.

Despite the evident economic values of wildlife, to the average citizen it is worth most because it contributes to the joy of living. An afternoon in the open, a camping trip, a hike to the mountains: none of these is complete unless wildlife is present. A forest without birds or deer satisfies neither the sportsman nor the nature lover seeking recreation. A healthy interest in nature and the outdoors, which comes inevitably when one has learned something of the habits of our birds and other animals, insures to any person an inexpensive way of securing the recreation necessary if one is to live happily in this high-pressure age. And not only do city dwellers profit from a knowledge of creatures of the wild: the farmer on whose lands most of our wildlife depends for existence will himself find life more interesting if he sees bobwhite quail using a feedpatch he has planted for their benefit, if he finds that rabbits are using as hiding places the hollow logs he left in the farm woods for their protection, or if he can mark the time of arrival and departure of the migratory songbirds that visit him in summer.

If the aim of education is self-propelled intellectual activity, it seems to me that wildlife offers an effective means of getting the initial interest that must be present if a pupil is to think for himself. As the pupil learns, this initial interest will inevitably be broadened to include the other natural resources with which wildlife is interdependent. Since man's activities must harmonize with nature if civilization is to endure, it should not be difficult to stimulate the interest aroused through using wildlife as an approach, to include many problems of contemporary living. Knowledge and planning and patience are necessary to administer wildlife, lands, forests, and waters just as they are necessary to administer an individual life, a business, a community, or a nation. Man's experiences with wildlife and other natural resources illustrate the far-reaching effects of seemingly inconsequential acts, so well expressed by Francis Thompson:

. . . All things by immortal power,

This pair of bobwhites produced 501 eggs in four seasons.

A fawn in its habitat.

Ruffed Grouse.

Near and far,
Hiddenly
To each other linked are,
That thou canst not stir a flower
Without troubling of a star.

Experimental units on conservation, arranged by Miss Ercelle Bennett and Dr. Wm. S. Long of Radford State Teachers College, will be furnished without charge to teachers by the Virginia Wildlife Federation at Blacksburg. Supplementary material in the form of government bulletins and other publications is also available from the Federation. Within a few months it is expected that a teacher's handbook on conservation units, to be prepared at Teachers College, Columbia University, will be completed and available for distribution.

The Place of Science In the Revised Curriculum for Virginia High Schools

J. L. B. BUCK,
State Department of Education

IN the Revised Curriculum proposed for Virginia high schools, study in the field of science has a prominent and important place. In the core curriculum, which is that part of the school offering planned for all pupils, there is a strong emphasis on science in the outline of problems proposed for study in the first and second years, and in the problems proposed for the third and fourth years of the core curriculum some emphasis on science will continue. In the field of electives it is expected that high schools will continue to offer, within the limits of their resources, whatever courses in science may be desirable to satisfy the special needs of pupils for college entrance or for any other legitimate purpose.

Science in the Core Curriculum

First Year.—The Virginia teachers who have participated in the preparation of materials for the core curriculum have proposed that the emphasis given to science for the first and second years of work be about equal to that given to the social studies or to English. In the materials prepared during the summer of 1938 for the first year of high school the following major problems have been proposed: (1) Improving Our Provision for Food and Shelter and Making Them Available for All; (2) Conquering Disease; (3) Adjusting Home Functions and Home Relationships to Meet the Demands of Modern Society; (4) Meeting Needs Through Adjusting Community Institutions. It is obvious that in problems (1) and (2) the study will be predominantly in the field of science.

Second Year.—The major problems proposed for the second year of the core curriculum are as follows: (1) Making the Best Use of Natural Resources; (2)

Adjusting Agriculture to Meet the Conditions of a Power Age; (3) Improving the Quality of Urban Living; (4) Learning to Use Leisure Time Satisfactorily. As in the first year, two of the problems proposed for the second year lead to study which will be largely in the field of science. The so-called social processes into which the major problems are divided give further convincing evidence of the emphasis on science. For example in the major problem "Conquering Disease" the following sub-divisions (social processes) are proposed : (a) Using Scientific Knowledge to Achieve and Maintain a High Standard of Health; (b) Removing Health Hazards from Industry; (c) Preventing and Controlling Diseases of Plants; (d) Preventing and Controlling Diseases of Animals.

In the major problem "Making the Best Use of Our Natural Resources" the following sub-divisions are proposed: (a) Conserving Our Soil; (b) Conserving our Forests; (c) Conserving Our Water Supply; (d) Conserving Our Mineral Supply; (e) Protecting Our Game and Seafood; (f) Protecting Natural Beauty; (g) Conserving Human Resources.

It is plain that such a development of the study will give an abundance of opportunities for experience in the field of science both of a laboratory experimental type and of an appreciation type.

Third and Fourth Years.—While the core curriculum problems of the third and fourth years will involve study, most of which would be classified in the fields of social studies and language arts, it is expected that science will be given enough attention to develop further understandings and appreciations in this important field—the type of experiences during these years will probably not involve laboratory experiments in science but it is expected that the interest in sciences will be maintained by judicious references to scientific developments.

Science Offered Through Elective Courses

As stated previously it is intended that the needs for any science other than that which is studied in the core curriculum by all pupils will be met through a variety of electives. These electives might include chemistry, physics, zoology, psychology, physical geography, navigation and surveying and any other science courses for which a need might be felt by a large enough number of pupils to justfy organization of a class.

Individualized Courses.—The rapid increase in the use of individualized courses commonly known as "supervised correspondence courses" indicates that this means of taking care of individual needs for special courses, when it is not practicable to organize classes, is serving a very useful purpose. Many state universities and other public and private educational agencies publish these individualized courses and sell them for varying fees. Courses in the field of science include, in addition to the familiar courses in general science, biology, chemistry and physics, various branches of agriculture, radio, photography, television, electricity, Diesel engines, nutrition, nursing, etc. It is hoped that more Virginia high schools will experiment with these individualized courses.

Materials Now Available for High Schools

In the tentative course of study for grade VIII of Virginia high schools, published in 1934, the proposed study was divided into sections for each of the major subject matter fields—the study suggested in the field of science provided experiences in agriculture, home economics, biology and in what is usually termed general science. In the tentative materials prepared in 1936 a somewhat different method of organization was used but a division of the study into the several fields was continued. In the materials prepared during the summer of 1938 the presentation of the problems was made without any separation into science, social science, language arts and mathematics —the teachers who prepared the 1938 materials desired to avoid this separation but, as stated before, the science emphasis is very obvious in these materials.

Conclusion

It seems safe to assume that most pupils in schools which are using the core curriculum plan and which are using the revised materials will have a much more extensive experience in the field of science than will those in schools which follow the old offering in which only one unit of science was required. It is hoped that the pupils' study of social problems will involve experiences in the field of science which will be more meaningful and functional than that given in the traditional courses.

Are We Making "The Great American Desert?"

DR. FRANK THONE,
Editor in Biology, Science Service

(Science Service and Every Week Magazine, by permission.)

GRAY-YELLOW dust, borne on a dry, scornful wind, fogged out the sun over Eastern seaboard cities. People looked and wondered. Housewives were annoyed: more cleaning to do. Airplanes had to stay grounded. Port navigation was doubtful for a day or two.

Then the sky cleared, and business went briskly forward again. But people remembered. For a long time they will remember. They will tell their children, their grandchildren, of the Great Dust Storm of '34.

They will have this portentous thing to tell about as long as they live. But only on one condition, that is, that they now take steps to keep others like it from coming again—from coming again so often, and so calamitously, that there will be no thrill in the telling because such storms shall have become a burdensome commonplace.

An impoverishing commonplace, too. For when the peeved housewife re-vacuumed her rugs and dusted her furniture, after the sifting dust had passed on, she was throwing bread out of the house. Not this year's bread, next year's. Bread that might have grown as wheat on a farm in Kansas or western Iowa, but now can never be harvested or milled or baked. Lost bread.

For that great dust storm, the first of its kind that ever blew so far as the Eastern seaboard, was made of the best topsoil of the Midwestern grainlands. It had the mineral elements in it that are needed by plants, to be added to water and air and sunlight to make food. Lost from the farms, it can never be replaced, at least in humanly calculable time.

Dust storms like that have been fairly frequent things, of late years, but only in the Midwest. They start in Colorado or Nebraska, choke lungs and sting eyes in Iowa and Illinois; not until recent years have they ever reached the East.

In ancient times such an unfamiliar event would have been regarded as a portent and a sign of warning of disaster to follow, as was the Darkness over Egypt in the time of Moses—itself not improbably just such a dust storm. Our dust storm was a portent and a sign of warning, needing no supernatural sanction to make its lesson clear for the eyes and the minds of people who are thinking—as many are thinking hard today. It was a sign of warning that the farm problem of the Midwest is a national problem, not a regional one. It was a warning that the soil there, and elsewhere in our country, too, is in danger of becoming a nomad soil, a gypsy soil, abiding nowhere, profiting nobody, turning from its age-old function of creating wealth to a new rackteering occupation of destroying property and impoverishing the people.

It was a warning that under our planless, systemless, anarchic mode of land use we are about to make a reality out of a myth. We are getting ready to create The Great American Desert.

When Brain-Truster Thomas Jefferson became President, a century and a third ago, one of the important moves in the New Deal of his day was the purchase of a great chunk of land west of the Mississippi. The opposition newspapers of his time denounced him for "usurping the powers of Congress" when he did so, and Jefferson himself admitted (with a red-headed, freckled grin) that he had "stretched his power till it cracked."

The opposition newspapers also declared that the fifteen million dollars of taxpayers' money which Jefferson had squandered on this 800,000 square miles of territory was just poured into a hole—for was not almost all of that land comprised in The Great American Desert?

But Jefferson only sent out his trusted friends, Lewis and Clarke, to look over the bargain he had bought, and they quickly laid the ghost of the Great American Desert myth. Within a generation after the return of their expedition, the scoffers' sons were getting rich selling wagons and plows and guns to the pioneers who were going out into this Great American Desert, to break the virgin sod and raise crops such as not even Joseph dreamed of when he was Pharaoh's overseer in the Seven Fat Years of Egypt.

But a Pharaoh has arisen in this land, who knew not our Joseph, and his name is Agricultural Overproduction. The needy years of the World War called for wheat, wheat, wheat, always more wheat; called for meat, meat, meat, always more meat. It

was a patriotic duty to produce in excess. Land was plowed beyond the margin of safe grain farming, herds were bred past the capacity of rangelands to support them.

And when the men of Europe stopped killing each other and went back to their own farms, throwing tariff hedges around themselves, down came prices. And American farmers, unorganized, could only meet lower prices by raising more stuff to sell. And the land was plowed to dust, grazed clean as though shaved with a razor.

Then came the drought, and with the drought the wind. And the land, with no more grass-roots in it to hold it in subjection, rose in anarchy and filled the sky, a portent and a sign of warning. And people who had never thought of the farmer's troubles before, wiping a film of his farm out of their eyes and coughing it out of their throats, were perforce made thoughtful of them.

What are we doing with our land? The question is on city tongues as well as country tongues now. It is asked in the East as well as in the West. What are we doing with our land? Are we really making a desert of it?

The suggestion is not as fantastic as it sounds. There are other man-made deserts in the world, or at least deserts where the recklessness or hunger-drive of men have supplemented the unkind offices of a slowly dessicating climate and brought the region to agricultural suicide. China can tell us, and Africa.

Not long ago, a scholarly Chinese was talking to a well known, widely traveled American newspaperman. A drought was over China, with famine certain to follow, and a dust storm was raging outside as he spoke. Said the Chinese:

"These droughts, dust storms and famines are just what you Americans are in for unless you wake up in time. I can understand them in China because the damage was done centuries, even thousands of years ago—before people knew what deforestation and bad farming could do to a nation. But I cannot understand a country like the United States allowing such a thing to happen."

"China," he added, "ought to be the 'horrible example' in this respect to all the rest of the world."

China is not asleep any longer, either. China is out to salvage the fertile lands she has left, and even to redeem the desert, if "domestic fury and fierce civil strife", and the ambitions of imperialistic foreign powers, only give her a chance.

A dozen years ago, a quiet young Chinese was studying in the botany department of the University of Chicago. "When I finish here, I go to Yale, study forestry," he explained to an American fellow student. The American looked his surprise: he had always understood there were no forests in China. "Oh, yes," the Chinese continued, with a quick smile, "your foresters have as their task to conserve the forests. It will be my job in China to *make* some forests!"

America might do well to follow the good example of this modern Chinese scholar rather than the ill example of the ancient land-ruining Chinese peasants.

Africa also speaks. For centuries the population of South Africa has been increasing, though even yet it is not overcrowded. The methods of the natives have been astonishingly similar to those of our own Western ranchers: raise little patches of grain and vegetables, graze the land empty, and move on. Winds whip across the denuded soil, scouring its surface away. Sudden heavy rains lash it, furrowing it, cutting cattle and game paths into runnels, and these into crumbling gullies. The good surface soil goes into the streams and chokes them with silt; the new surface is not only cut to pieces physically but is impoverished chemically. European administrators are very much concerned and discuss means of inducing the population to shift to better lands and cease their ruinous methods of exploitation.

Does it not all have a familiar sound?

Man has been a herdsman for not over ten or twenty thousand years, an agriculturist for perhaps six or seven thousand, but in the older agricultural lands he has already ruined himself, and even in our boasted "advanced" America the same unintelligent process is going on at an accelerated pace.

At least, though, there are those among us who have seen the peril and have given us warning, if we will only listen to them. There is still time. We may have bread tomorrow, if we will agree to be less greedy today.

The remedy? Simple—though laborious, and not swift. Just this: fill the soil with roots again. Quite literally, "Go to grass!" And trees.

What is now the rich plowed corn land of Iowa and Illinois and eastern Nebraska was once long grass prairie. Farther East, in the Ohio valley and the Great Lakes country and the Deep South, there were forests. We cut and burned down the forests,

plowed out the deep-rooted prairie sod. In doing so, we destroyed the innumerable tough cords of roots that held the soil together. The living green lawgivers once held the loose anarchic unalive soil particles together. We destroyed them. If we would end the insubordination of the soil, we must restore them.

That does not mean that we must give the whole country back to the forests and wait, like Elijah, for ravens to come down out of the tree tops and feed us. It does not mean that we must grow only long grass where now the tall corn grows and turn ourselves out to pasture, like Nebuchadnezzar. We can keep our corn fields. But it does mean that we must set regiments of trees and phalanxes of stubborn, deep-rooted permanent grasses on sloping lands to discipline and halt the runaway soil. It does mean that we must throw zones of permanently-rooted plants around the plow lands, to imprison the truant land.

And in all this, the cow, patient bereaved foster mother of our human race, will be our chief ally. Already she is responsible for a quarter of the total farm income; and Secretary Wallace, the farmer-scientist who is now adding statesmanship to his laurels, insists that she needs a lot more work. It is tragically true that the children of the poor do not get enough milk to drink. It is even more shockingly true that the children of the rich do not drink enough milk, either. And there is plenty of room inside the grownups, too, for the products of the cow.

Cows must have grass. True, they feed them "concentrates," like cottonseed meal, alfalfa meal, soybean meal, and so on, but grass they cannot do without, if the milk is to have its proper vitamin content for our health and if the cow's own health is to be maintained.

The menace of soil waste looms like a genie in an oriental tale. Its possible exorcism reads like a nursery tale of the sunset lands:

The farmer began to plant the seed, the grass began to hold the soil, the cow began to eat the grass, the children began to drink the milk. . . . A whole cycle of beneficence, if it is only inaugurated in time.

A special bureau of the Department of the Interior, known as the Soil Erosion Service, is striving hard to get it inaugurated. With pick and spade they labor on thousands of wasted acres that may yet be saved; with the spoken and the radioed and the printed word they spread their gospel to scores and hundreds of thousands of anxious listening farmers and foresters and feeders of cattle.

And this is the heart of the gospel they preach:

Get roots back into the soil!

THE MIND IN MOTION

"In peace as well as in war the mind must be kept in motion."

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Stories of American Industry. Series I and II include over fifty stories of important American industries.

Underground Struggle in Germany. An L. I. D. pamphlet.

Women in Industry.

The University of Virginia Extension Division will be glad to lend any of these publications or tell how they can be secured.

School Libraries - Danville, Virginia

MARGARET D. WRIGHT, *Librarian, George Washington High School*

TEN years ago there was no regular or orderly school library service in our schools, not even in our senior high school. A few dozen books found to have no use in private libraries were thought useful for high school students. Thus, our high school "library" of this date became filled with discarded volumes and dry-as-dust cheap sets of books that had been received as premiums for magazine subscriptions. These books were stacked in a small, dark, inside room which had been designed for a storage closet. Such a library was, of course, of little value and of little use, but it was typical of many school libraries of a decade ago.

When the new George Washington High School was erected, the library was made a conspicuous, central feature. A full-time school librarian was employed and a systematic scientific program of purchasing new books and of providing real library service was begun. Miss Mary V. Gaver, who had taken graduate courses in library science at Columbia University, was the first professionally trained school librarian to be employed in the Danville schools.

It is within the past eight years that the Danville public school system may be said to have developed an extensive functional library service throughout both secondary and elementary schools. At present there are libraries in the two high schools and five elementary schools of the city. Each school has a librarian, or a teacher who has had library training in the position of full-time librarian. The school librarians maintain a departmental organization, which keeps them informed concerning library practices and the library principles and projects in the several schools. Departmental meetings under the direction of a chairman and secretary are held twice each month. With the realization that the library is not a school subject but a laboratory which contributes to the successful study of all school subjects, the Danville schools are working toward the idea of general supervision of all school libraries by a professionally trained librarian.

The types of school organization in Danville, the departmental plan in junior and senior high schools and the duplicate (modified platoon) plan in elementary schools, lend themselves most effectively to good school library service. The high school groups have voluntary library attendance during study periods and class attendance for special work. The elementary schools schedule regular periods for library attendance. At these periods it is planned and desired that the following kinds of reading procedures should be followed: Reading of the reference variety assigned by teachers; reading of books from selected lists; free reading; specially selected types of reading, in the regular classroom, from library books. All these various types of reading procedures tend to make the library the integrating factor in the elementary school curriculum and point the child toward his reference, parallel, and pleasure reading in the high school and general reading through life.

The financing of school libraries in Danville is now on a basis as definite as any other form of school service. A per capita appropriation for libraries is made from public funds in the annual school budget. This appropriation designates one dollar per capita for senior high school students, fifty cents per capita for junior high school students, and twenty-five cents per capita for elementary school students. This allotment may seem a very small amount per capita but it represents real progress in our school library financing, and, supplemented by specially raised school funds, private donations, and state aid, presents a fair financial picture.

Negro schools, in Danville, are also considered in the development of organized school library service. The Negro high school receives library service from the Grasty branch of the Danville Public Library, which is located in the high school building. A full-time librarian is employed and the library receives a yearly appropriation from the school board of $175.00. The Public Library, which is a department of the city government, matches or overmatches this amount. An appropriation of $150.00 is made by the school board for the purchase of books for Negro elementary schools. The children attending the largest of the three Negro elementary schools have access to the Negro high school library.

Public school authorities in Danville, having recognized the importance of a well organized and operated library system, have made regular provision for

effective library service. Progress in library development in the Danville schools is especially notable when one compares library conditions ten years ago and now. It is the frequently stated belief that the remarkable progress made in their regular work by pupils attending the Danville public schools is due to the cultural advantage of wisely selected, steadily available, reading material and to the systematic reading program which is provided through the Danville school libraries.

Talking It Over

Increased Salaries for Teachers

CHARL ORMOND WILLIAMS, ***Director of Field Service, National Education Association, Washington, D. C.***

MORE than three quarters of a century ago, a small group gathered in Philadelphia and there launched a national association for teachers. In the following statement, William Russell, from Georgia, suggested to the group the purposes of the organization:

Charl Ormond Williams

"... . a strictly professional association of . . . all who are engaged in our occupation throughout the United States, and having for its aims a faithful and persevering endeavor to enlarge the views, unite the hearts, strengthen the hands, and promote the interests of all its members."

Out of this pioneer effort came the National Education Association of the United States, a mighty factor in practically every outstanding educational advancement in the country.

Down through the years, the Association has thrown the full force of its power and prestige behind movements to advance the teaching profession. Important among these movements is increased salaries for teachers, the theme of this article.

Soon after the World War when thousands of schools were closed partly because of a shortage of teachers due to unnecessarily low salaries, the Association established a Research Division in its headquarters office with instructions to direct its first work to a solution of this problem. From that day on, this Division has striven unceasingly to assist in all efforts for better salaries. Every two years a study of city teachers' salaries, based on information received from thousands of school systems, is made. The 1938-1939 biennial study will be ready next March. Also during the year one of the first real studies of the distribution and inequalities of rural teachers' income will be published. No other national organization has such comprehensive information about the economic status of its members.

The Research Division receives daily requests for facts and figures on salary scheduling for which a committee of teachers or school board members is often waiting before proceeding with a program. A number of recent salary schedules not only quote sections from our Research Bulletins but include provisions based on recommendations in these publications.

This year the Division will devote major attention to helping local and state salary committees. There is now in process of preparation a handbook on salaries based on the problems encountered by salary committees and methods used to meet them.

In addition, the Research Division is assisting a committee studying the basic principles on which a sound salary schedule should rest. This committee includes a member from each Southern state.

Vigorous plans are now in progress to secure from the next Congress generous appropriations for federal aid to education, 80 per cent of which will be spent for teachers' salaries.

Though salaries in many communities are still distressingly low, the fact remains that the average annual salary of teachers in the United States is today eight times larger than it was in 1870! At the present time, the membership of the National Education Association consists of only one-fifth of the teachers of the nation. What the Association has accomplished with the support of one teacher in five strikingly indicates what it could do if the nation's million teachers were enroled in its ranks.

Students Cooperative Association Programs At Amelia

MARGARET RUTHERFORD

IN Amelia High School, the pupils have a well organized and active S.C.A. which meets monthly. At these meetings the entire student body is present and a general business session takes place. However, since the aim of S.C.A. is to mix business with good wholesome fun, it is always someone's task to work out a program of entertainment to follow the business proceedings. This is in the hands of a program committee which is appointed at the beginning of the school year and serves for the entire school term.

In order to have variety and to get away from the cut-and-dried type of program which has been so overworked, this committee attempts to put on original presentations which require little preparation and talent but which possess a spirit that makes for school enthusiasm.

This year the committee chose as its theme that of "Impressions" around which the various programs are to be developed. Although the plans are as yet very indefinite and incomplete, the main idea of the committee is to present a series of skits which will enable the students to see themselves as others see them. The following topics are being worked on:

1. Freshmen impressions of seniors.
2. Senior impressions of freshmen (Before and after—to show what the high school environment has done for them after a certain length of time.)
3. Pupil impressions of faculty.
4. Faculty impressions of pupils.

These programs will be supplemented with more timely entertainments at Christmas and on other holiday occasions.

The topic which has been worked out in detail is entitled "Freshmen Impressions of Seniors". This was presented at the last meeting of S.C.A.

The inspiration for this program came as a result of the high school's having added to its enrolment about 80 new freshmen for this year. These pupils, who for the first time were making contact with high school methods and discipline, were naturally forming new impressions due to certain characteristics and idiosyncrasies of the upper classmen. With these ideas in mind the following program was developed.

A list of ten outstanding senior names was formulated—from the point of view of being different but at the same time typical of pupils found in every senior class. This list included the following personalities:

The bookworm.
The loud and noisy boy.
The primping girl.
The talkative girl who has to relate the previous night's experiences with a girl chum.
The boy-crazy girl.
The athletic boy.
The athletic girl.
The efficiency expert (bossy).
The habitual tardy boy.
The sophistocated girl.

Using this list as a guide, ten freshmen who most nearly resembled these types were selected to portray the part.

The scene was made to resemble any morning in the senior homeroom at the time when the pupils are arriving at school and are entering the room. It extended through the roll call and the opening exercises and came to a close when an unexpected senior class meeting was announced.

No special costuming was used; only a placard pinned to the freshmen bearing the name of the senior whom they represented. Different hairdress and small personal possessions were used when necessary.

Each pupil spoke a few lines, typical of the character which he was portraying, and by the aid of pantomime and extempore discourse with one another, he presented his characterization.

The general impression to be gained from this program was to show the seniors how their various actions and habits had been observed by these new pupils. Care was taken not to include anything which would cause embarrassment to anyone. It was presented with the proper spirit and was received with a spirit of fun and amusement.

Book Reviews

TICK-TOCK, A STORY OF TIME, by Flynn and Lund. D. C. Heath, New York. 1938. 234 pp.

The authors have developed in chronological order man's attempts to improve time-telling devices from the grass rope used by the cave man to the electric clocks of today. The descriptions of the various devices are woven around the lives of two children who have told to them stories that contain much entertaining factual material about time pieces.

Tick-Tock is written for pupils in the intermediate grades. The vocabulary and sentence structure are simple enough to be easily read by the average pupil in these grades. Pupils interested in reading informational material will find this book worth while.

A. E. C.

A Child's Review of the Same Book

This book is intended to give people pictures of people living long ago, of how they tried to make things that would tell time. Man's attempt to improve time from cave dwellers burning grass ropes to clocks of today is told about in this book. Long ago people used to tell time by grass ropes. Then the Egyptians told time by a stick laid flat on the sand and with a stick raised up above the end of the other stick. Later people used sundials that were hollow with numbers around the dial. Then came a time when people used sand clocks. After a long period of time the people used pitchers with little holes in the bottom. They would put a pan under the pitcher and let the water drip into the pan.

Next came the use of time candles. King Alfred and his men saved his people and England by watching the time candle. The water-gong came next. It was like a big brass pan. People would put a little bowl on a pool and when it sank a man hit the gong. After that came a clock that looked like a bird's cage. It was used about 300 years ago. Then man kept working until at last he made the electric clock.

If anyone wants to read a good book he should read *Tick-Tock*.

ELOISE HANES, Sixth Grade.

SCALES AND FINS, by Engleman, Salmon and McKemy. D. C. Heath, New York. 1938. 293 pp.

Built around the ambition of a boy who wishes to learn as much as possible about fish in order to win a prize of one hundred dollars, the authors have skillfully woven into the story, though a non-technical informal treatment, many scientific facts related to sea life.

The book is written for children in the intermediate grades, but it is more difficult reading than *Tick-Tock, A Story of Time*. The sentences are longer and more difficult. However, good sixth grade readers can handle the book and enjoy it.

A Child's Review of the Same Book

Scales and Fins is a book on fish and sea animals. It is written about a boy named Don Reid. Don and his father take trips, go to camps, and other places to fish. Don learns all about all kinds of fish.

The reason Don tries to learn about fish is he is trying to win a one hundred dollar prize.

The part I like best was when Don and his cousin Floyd were swimming in the Gulf of Mexico. Don sees a shark, or rather thinks he sees a shark. He runs up the beach yelling, "Shark, Shark". Some fishermen see Don and ask him where is the shark. Don points to something sticking out of the water. The fishermen laugh and say, "It is only a porpoise".

At the end of the book, Don comes running in the house and tells mother that he had won the prize. His mother laughs and says, "Did you get it all?" Don says, "Of course I got it all. Why wouldn't they give it all to me?" Mrs. Reid laughs and says, "I thought maybe they took off fifty cents for your thinking a porpoise was a shark".

Anyone who reads this book can learn about all kinds of sea life.

JULIA COCKS, Sixth Grade.

SCIENCE PROBLEMS, Book I, by Beauchamp, Mayfield and West. Scott, Foresman & Co., Chicago. 1938. xi 432 pp.

Science Problems, the first of a series of practical science books for junior high schools, is an interesting and authentic presentation of practical science for girls and boys of the seventh grade.

There are eleven units each dealing with familiar experiences in the child's environment. The units are introduced in such a way that the child gets an overview of the entire problem within the unit. This is done by a short discussion called "Looking Ahead" at the beginning of each unit and by problematic questions. The suggested problems and experiments throughout each unit aid in scientific thinking. The self-testing exercises scattered through the units stimulate the child to evaluate his own work. The book is not meant to make "scientists" out of all children but to help them to understand and appreciate their own environment.

The book is written in clear and simple language and from the child's point of view. Throughout the book there is evidence of an understanding of the seventh grade child as shown by the questions asked, the readable content, the illustrations, and the methods of evaluation.

This is the type of book that will be welcomed by seventh grade children and teachers.

M. K.

MEDICAL OCCUPATIONS FOR BOYS, by Lee M. Klinefelter. E. P. Dutton & Co., New York. 1938. 287 pp.

Using the same conversational method that he employed so successfully in his "Electrical Occupations for Boys" the author manages to bring together all the pertinent information that is needed by the boy who is faced with the problem of selecting an occupation in any branch of medicine. Not only does he treat of all of the divisions of medicine—general practice, specialization, technology, nursing, dentistry, pharmacy, and veterinary science, but he deals with such matters as general intellectual qualifications, attitudes, achievements, and personality of the candidate who hopes to make a success in any one of these fields.

Statistics are given in each of the vocations on the number of people already in the field and on the possibilities, financially and otherwise. There are lists of books dealing with each topic and of the various training schools in this country with their requirements.

The book is well written and very readable. It is a book for parents as much as for boys who have leanings toward medicine. It is a book for the high school library too.

G. W. J.

SCIENTIFIC INTERESTS IN THE OLD SOUTH, by Thomas Cary Johnson, Jr. New York and London. D. Appleton-Century Co., Inc. 1936. $2.50.

The Old South has often been accused of backwardness in such individualistic arts as poetry and novel writing and of almost total neglect of such community undertakings as the drama and of such technical endeavors as painting and sculpture. With such assumptions in mind, one would expect to find there an absence of creative science, which is an endeavor demanding a combination of individual inspiration, community cooperation, and technical proficiency. But, to the surprise of the naive, the Professor of American History in the University of Virginia has compiled a vast catalogue demonstrating varied scientific interests in the Old South. This diligent piece of unearthing is a most valuable contribution to learning. But Professor Johnson fails to evaluate his data; he fails to distinguish between dilettantism and creative endeavor and to make critical comparisons between Southern accomplishments and those of other peoples.

F. B. S.

SCIENCE IN GENERAL EDUCATION, A report of the committee on the function of science in general education. D. Appleton-Century Co., New York. 1938. 591 pp. Price, $3.00.

The limitation put upon the space allowed for book reviews in many periodicals is frequently a definite handicap to both the books and the reviewers. It may be that the great popularity of the book review section of the *New York Times* is due, in part at least, to the fact that there the reviewers are privileged to go along until they have told their stories so those who read the review have ample opportunity to know what the book is really about, and what the reviewer's opinions are about them and may therefore make reasonably safe choices in what to buy and what to read. It would appear that unless such latitude is allowed, many reviews were as well, or perhaps better not published at all.

In the result of a five-year study of the place of science in general education by an apparently very competent committee, the basic approaches to this problem which have always been highly controversial are described as follows:

1. Science Teaching in Relation to General Education.

2. Teaching Science to Meet the Needs of Adolescents in the Basic Aspects of Living.

3. Understanding the Student and Evaluating His Growth.

4. Using This Report as a Basis for Planning the Science Program. Certainly this book does not lend itself to an abridged or casual review.

Painstaking consideration of these fundamental issues is given under chapter headings which should in themselves stimulate the interest of science teachers in following the report of the committee through. Typical examples of chapter headings are: Why the Science Program of the Secondary School Requires Consideration; The History of Science Teaching in the Secondary Schools: Confusion as to Purposes and Procedures; The Psychological Basis for a New Approach. Topics selected at random from other parts also serve to emphasize this basic approach: The Purpose of General Education; The Major Ideals of Democracy; The Need for Effective Action in Solving Basic Economic Problems; and others equally as challenging.

Teachers who already take their work seriously will find in this interesting book a source for renewed enthusiasm. Further, the report of the committee is so organized and forcefully expressed that its use as collateral reading by science teachers generally must result in very definite stimulation of the desire to be worth more to the adolescent with whom they come in daily contact.

The committee has gone one step further than is usually done in studies of this kind. They have not left the philosophy of the subject in the air, but in the appendices given examples of illustrative material under four heads: 1—A Course in Functional Chemistry; 2—A Fused Physical-Science Course; 3—Unit of Public Health; 4—A Source Unit in Genetics.

The type is excellent, the binding attractive, and the general organization apparently all that could be desired.

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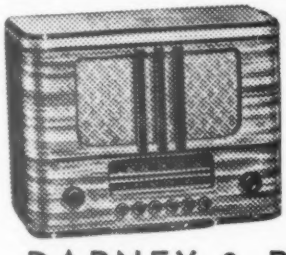

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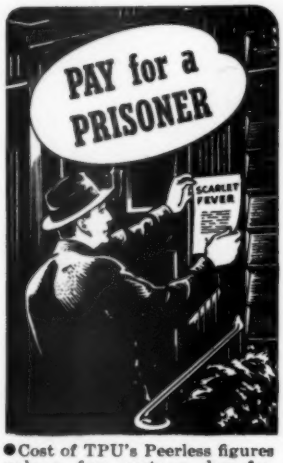

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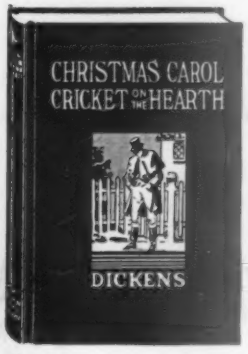

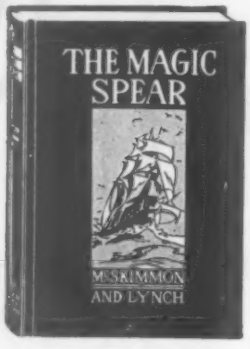

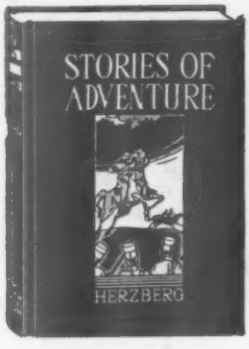

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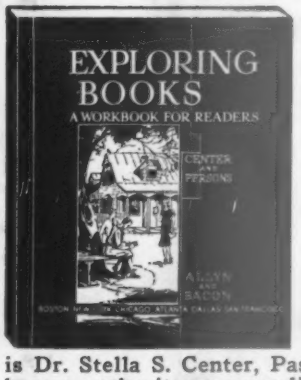

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For the eighth year the second workbook helps the pupils to enjoy eight readers: The Magic Spear, The White Company, The Black Arrow, Daniel Boone, The Last of the Mohicans, Plays Old and New, This Interlocking World, Tales from Shakespeare.

For the ninth year the third workbook covers ten readers: Ivanhoe, Book of Ballads, Modern Lives, Stories of Adventure, Myths and Their Meaning, Toils and Travels of Odysseus, One-Act Plays, Boy Life on the Prairie, Great Speeches, Quentin Durward.

The general editor of the readers and author of the workbooks is Dr. Stella S. Center, Past President of the National Council of Teachers of English and well-known authority on remedial reading, who believes that interest is the prime factor in teaching young pupils to read and enjoy literature. Exploring Books 1, 2, and 3 contain Miss Center's carefully designed plan for relieving the vagueness of the ordinary literature course and the tedium of the so-called anthology.

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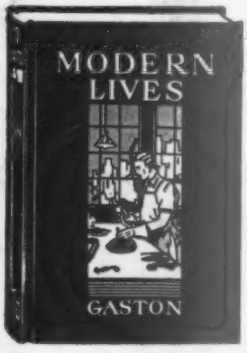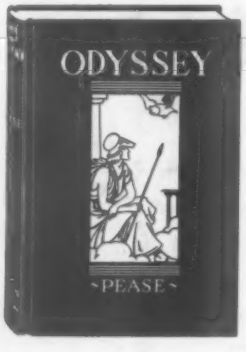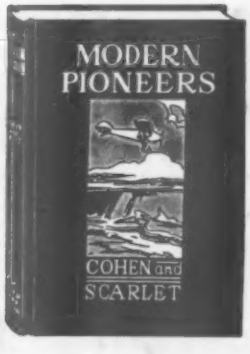
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